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Title: Today on Mars

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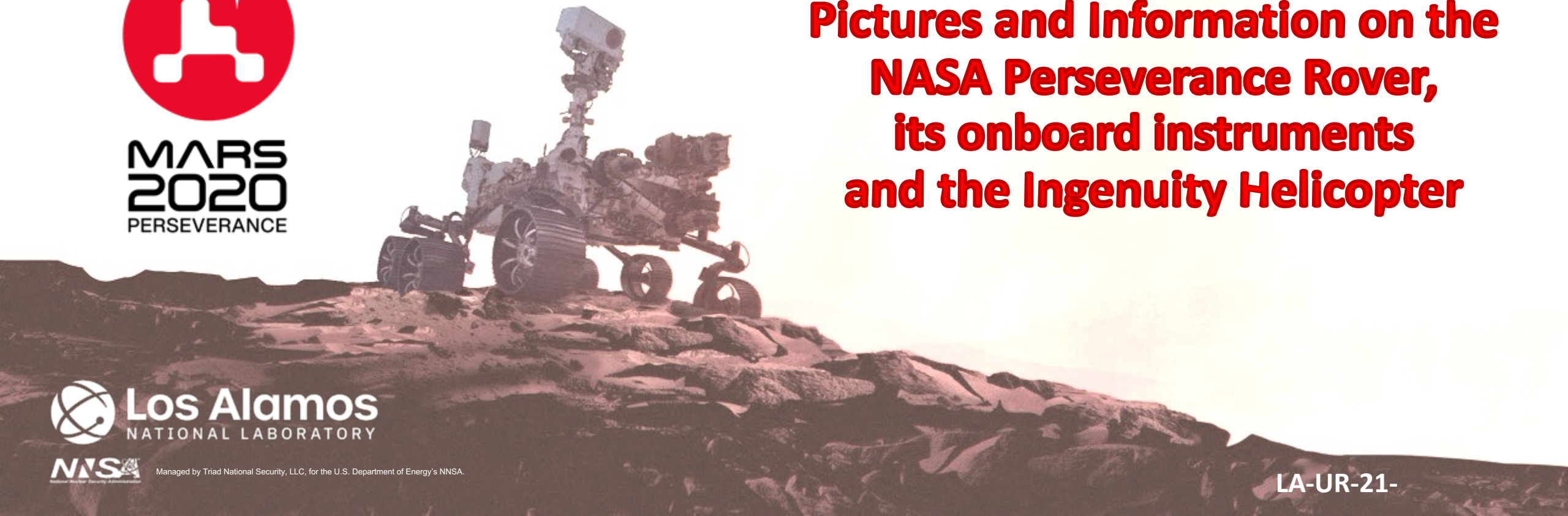
Today On Mars

MARS 2020
PERSEVERANCE



Pictures and Information on the NASA Perseverance Rover, its onboard instruments and the Ingenuity Helicopter

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NNSA

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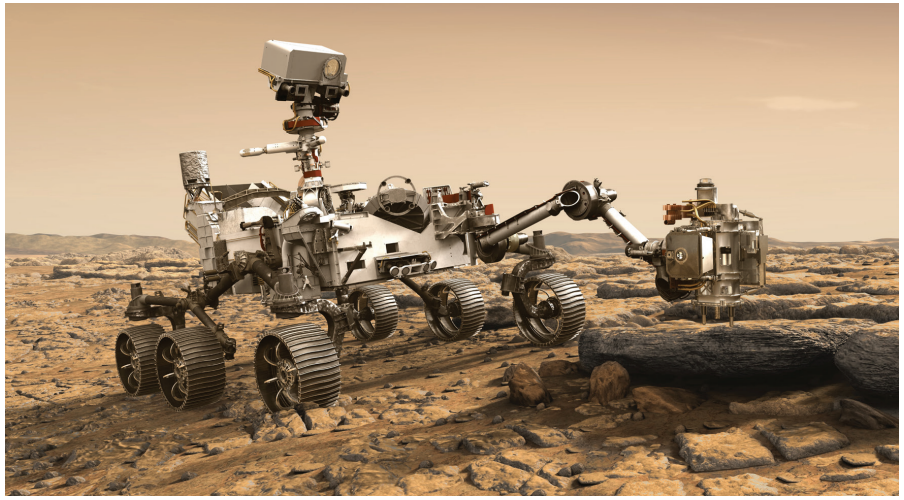
Mars 2020/Perseverance

Over the past two decades, missions flown by NASA's Mars Exploration Program have shown us that Mars was once very different from the cold, dry planet it is today. Evidence discovered by landed and orbital missions point to wet conditions billions of years ago. These environments lasted long enough to potentially support the development of microbial life.

The Mars 2020/Perseverance rover is designed to better understand the geology of Mars and seek signs of ancient life. The mission will collect and store a set of rock and soil samples that could be returned to Earth in the future. It will also test new technology to benefit future robotic and human exploration of Mars.

Key Objectives

- Explore a geologically diverse landing site
- Assess ancient habitability
- Seek signs of ancient life, particularly in special rocks known to preserve signs of life over time
- Gather rock and soil samples that could be returned to Earth by a future NASA mission
- Demonstrate technology for future robotic and human exploration



Mission Timeline

- Launch July 30, 2020 from Cape Canaveral Air Force Station, Florida
- Land on Mars on February 18, 2021 at the site of an ancient river delta in a lake that once filled Jezero Crater
- Spend at least one Mars year (two Earth years) exploring the landing site region

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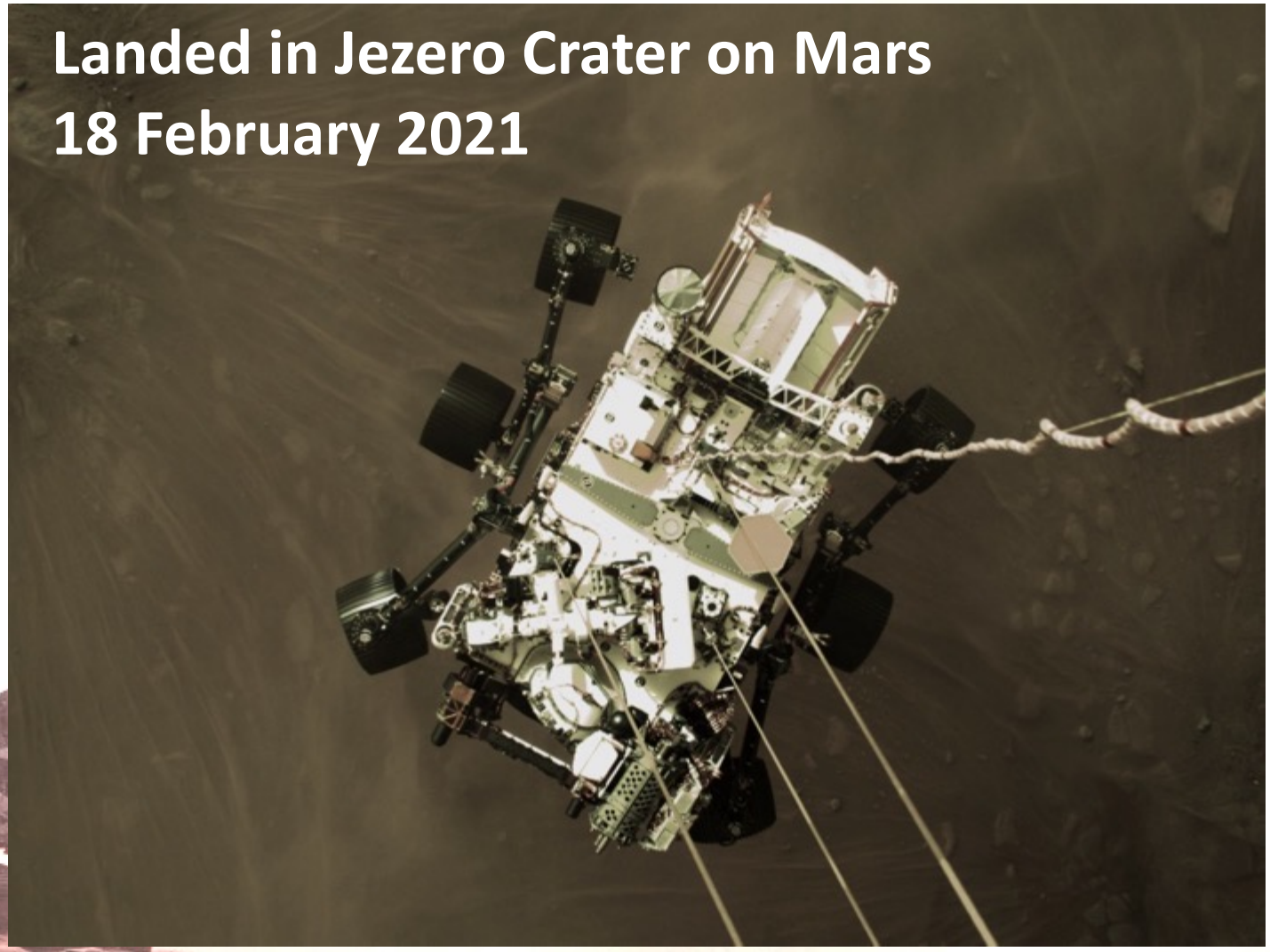
Images and information from https://mars.nasa.gov/mars2020/

Launch from Cape Canaveral 30 July 2020

Landed in Jezero Crater on Mars 18 February 2021



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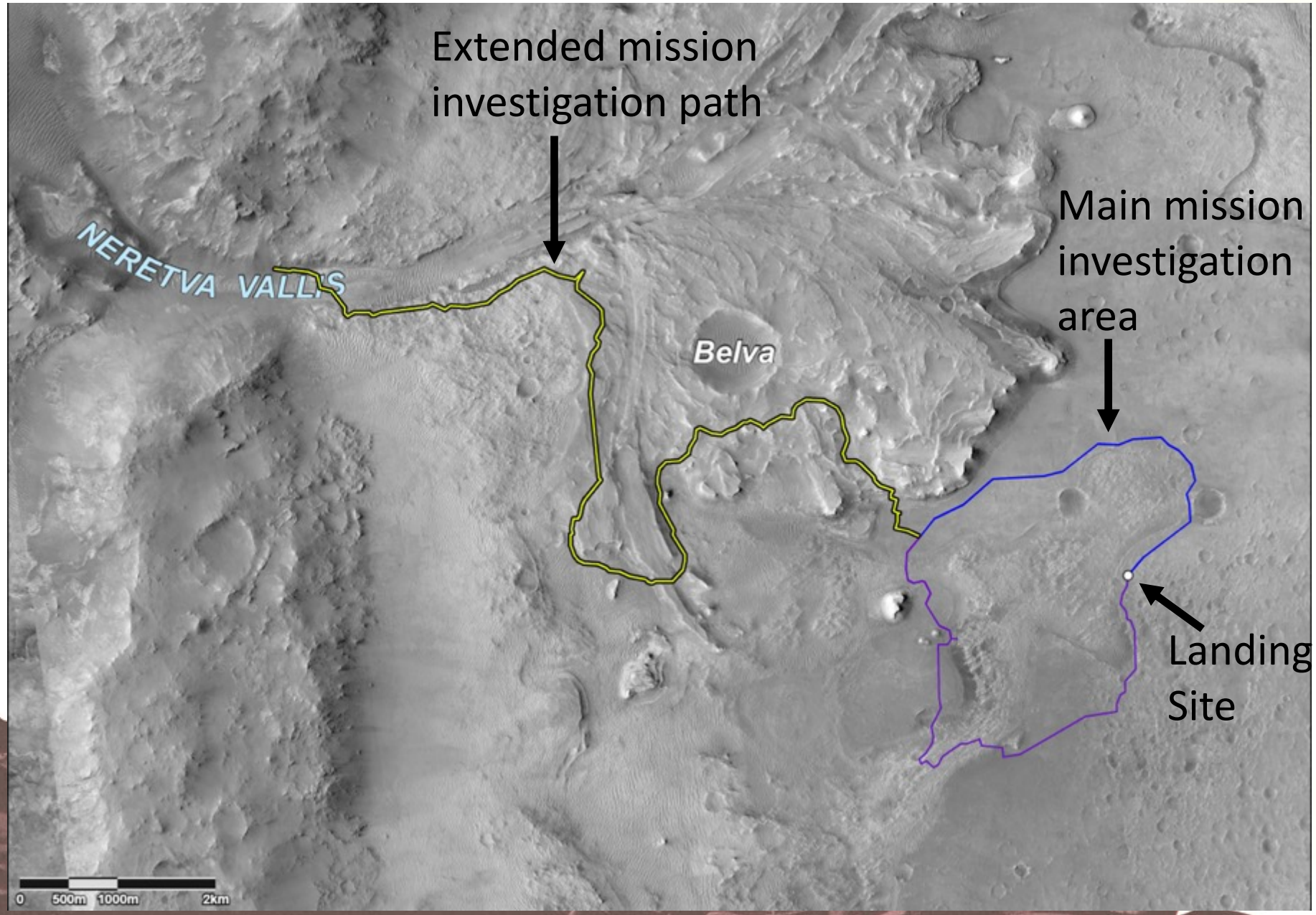
Images and information from https://mars.nasa.gov/mars2020/

The Perseverance Rover landed in Jezero Crater, an ancient lake bed



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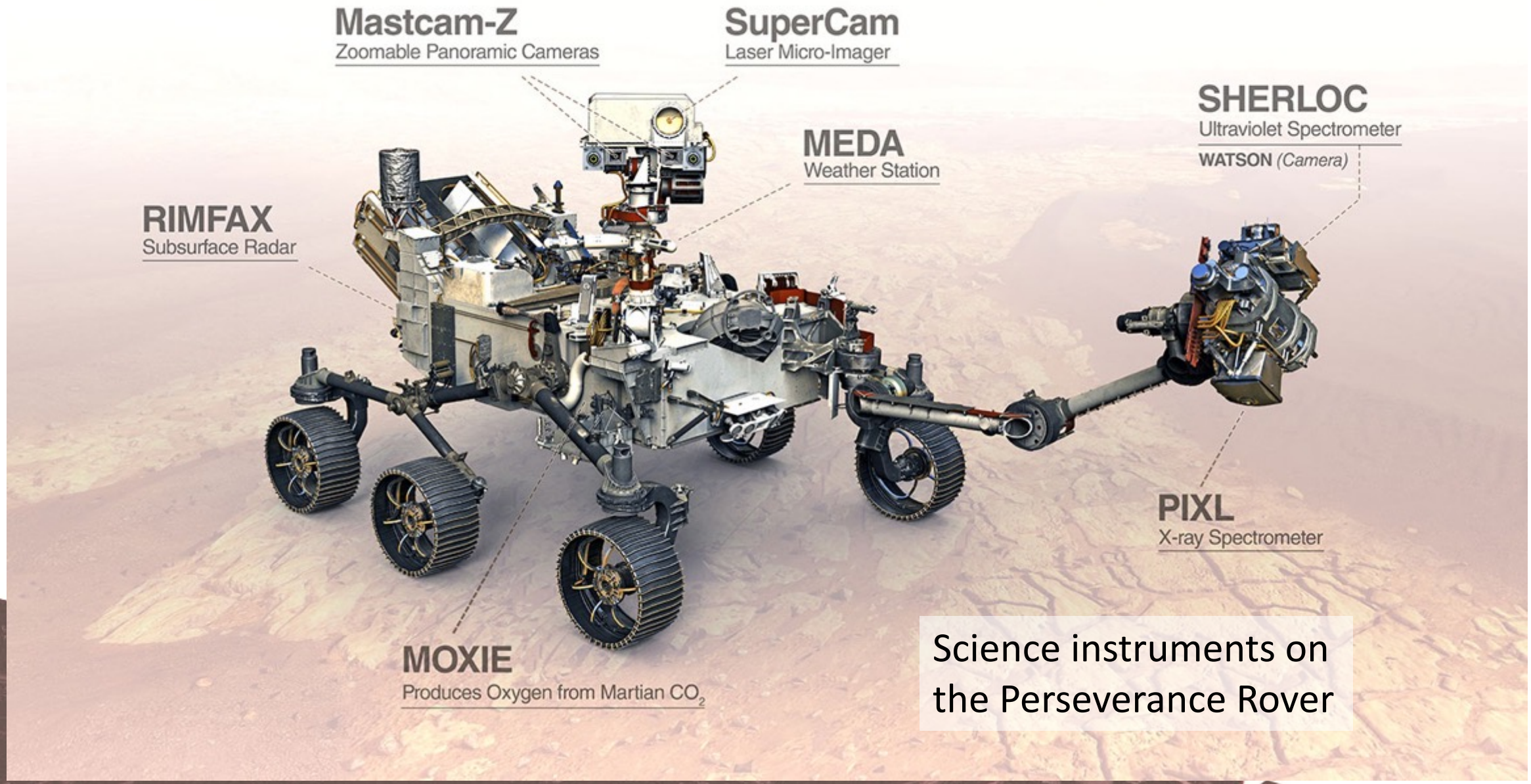
Images and information from https://mars.nasa.gov/mars2020/



Science instruments on the Perseverance Rover

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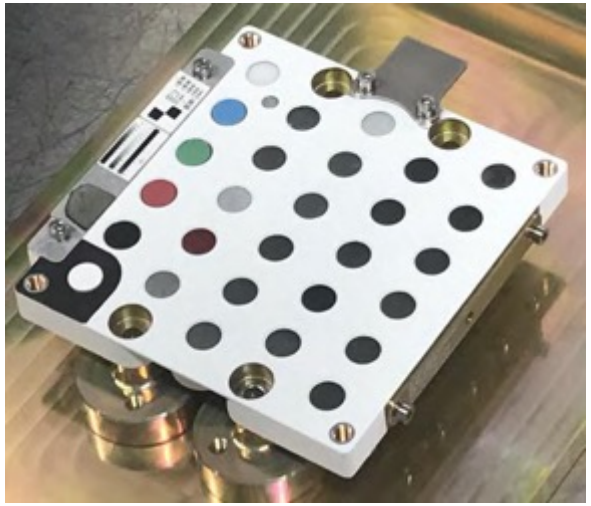
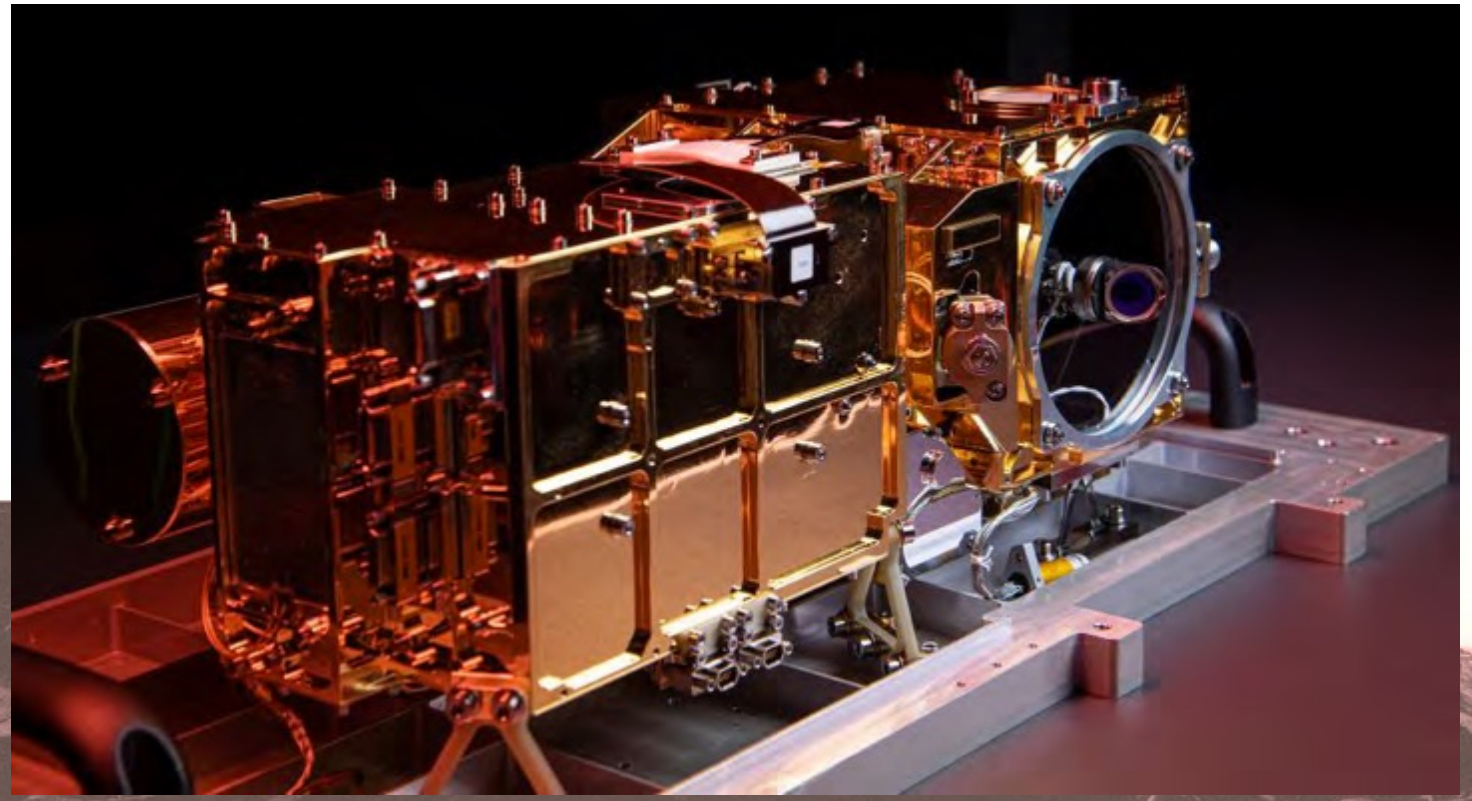
Images and information from https://mars.nasa.gov/mars2020/

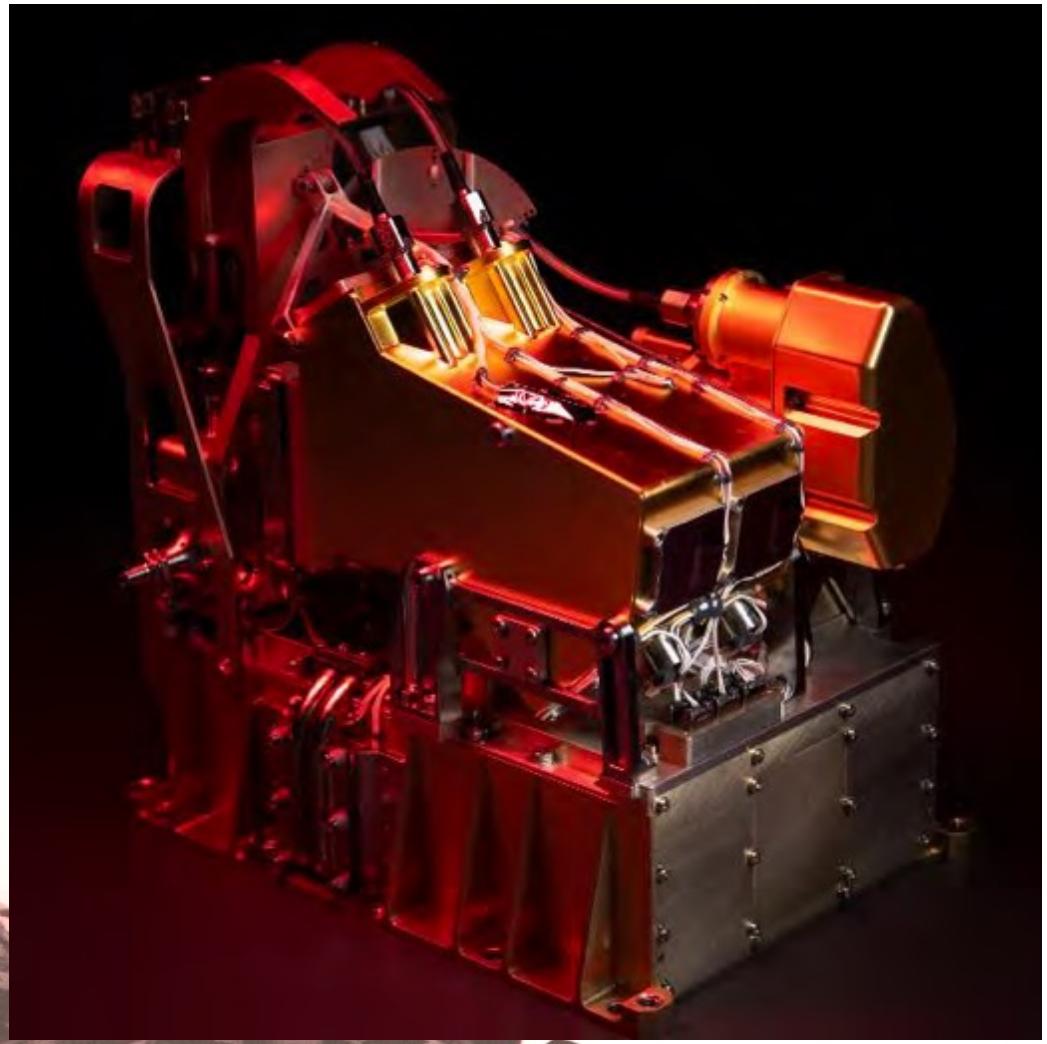


SuperCam Calibration Target built by University of Valladolid, Valladolid, Spain

SuperCam Mast Unit built by Institut de Recherche en Astrophysique et Planétogie, Toulouse, France



SuperCam Body Unit built by Los Alamos National Laboratory, Los Alamos, USA



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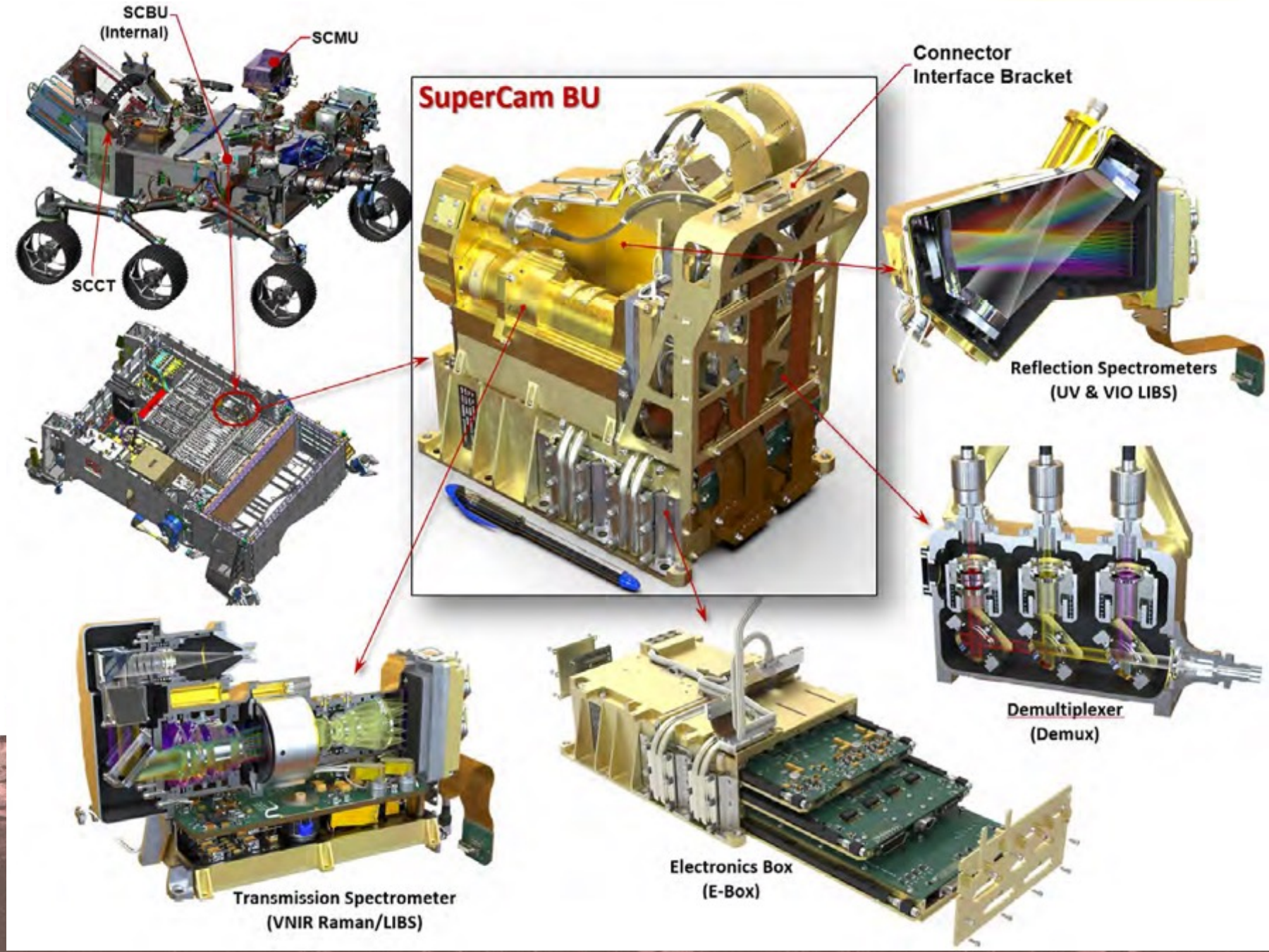
Images and information from LA-UR-20-23619

SuperCam Body Unit's location on the Perseverance rover and the major components of the instrument



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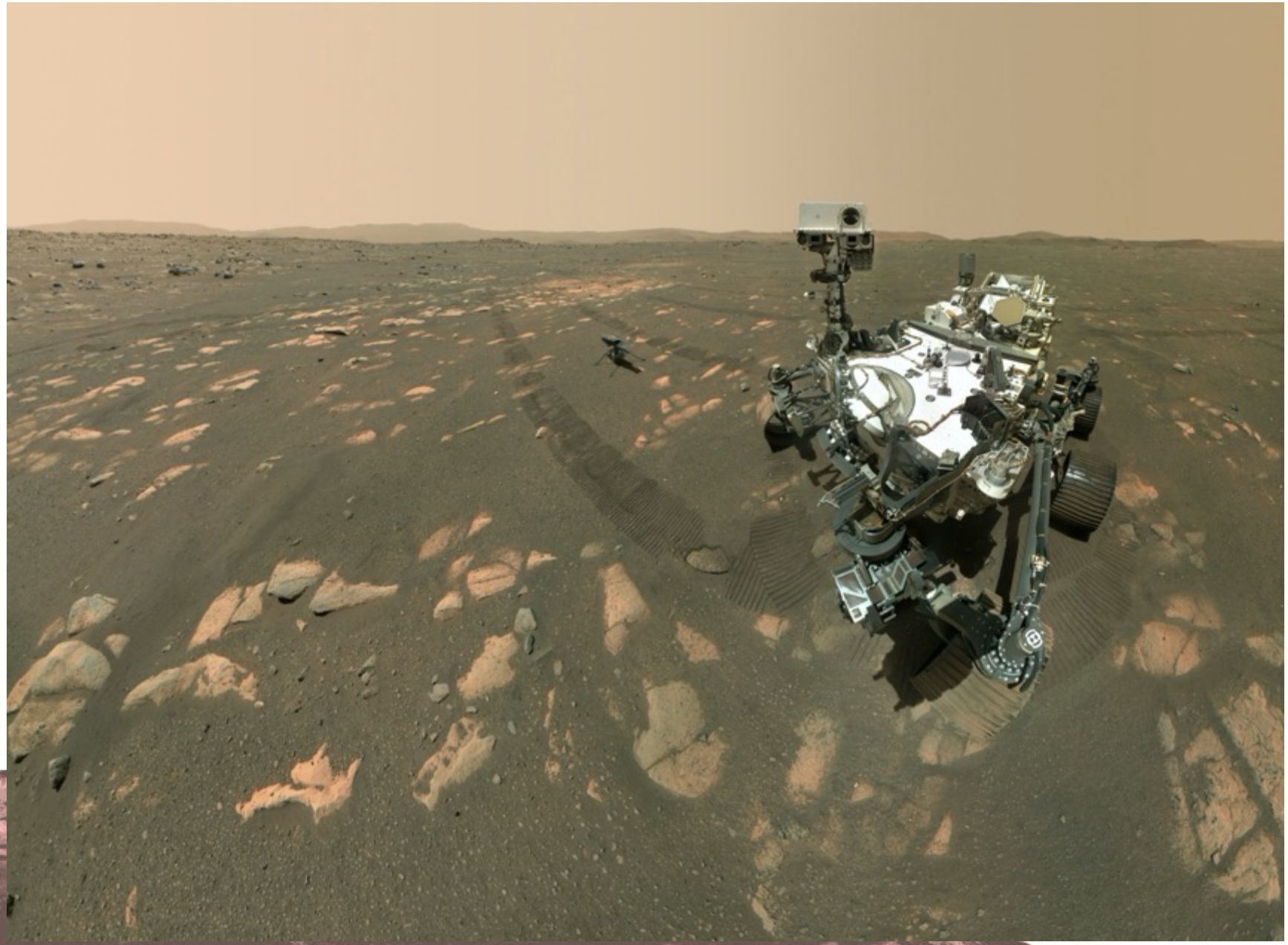
Images and information from LA-UR-20-23619

A selfie taken by the Perseverance Rover on 6 April 2021 with the Ingenuity helicopter in the background.



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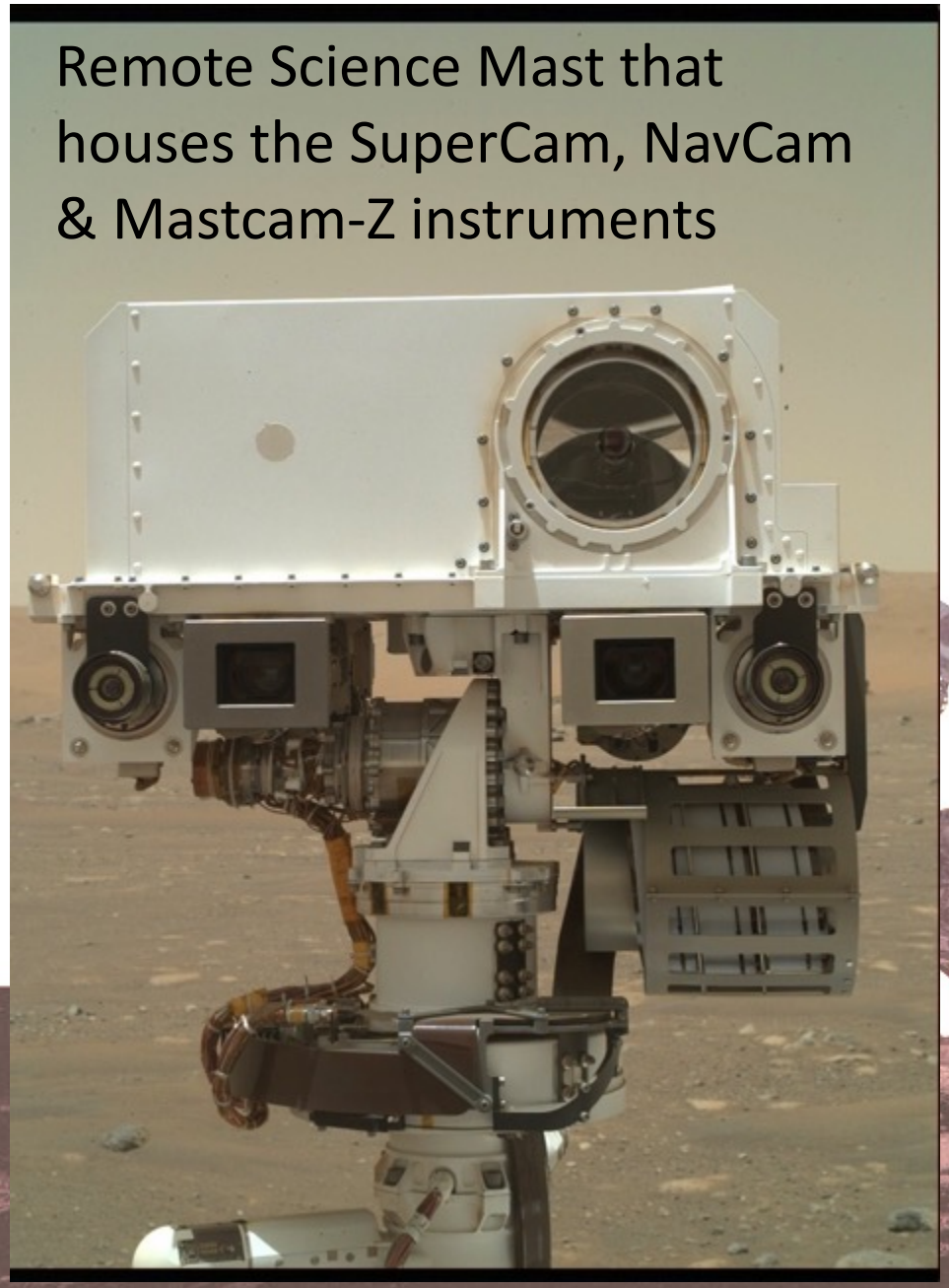
Images and information from https://mars.nasa.gov/mars2020/

Images of the mast and arm on the Perseverance Rover



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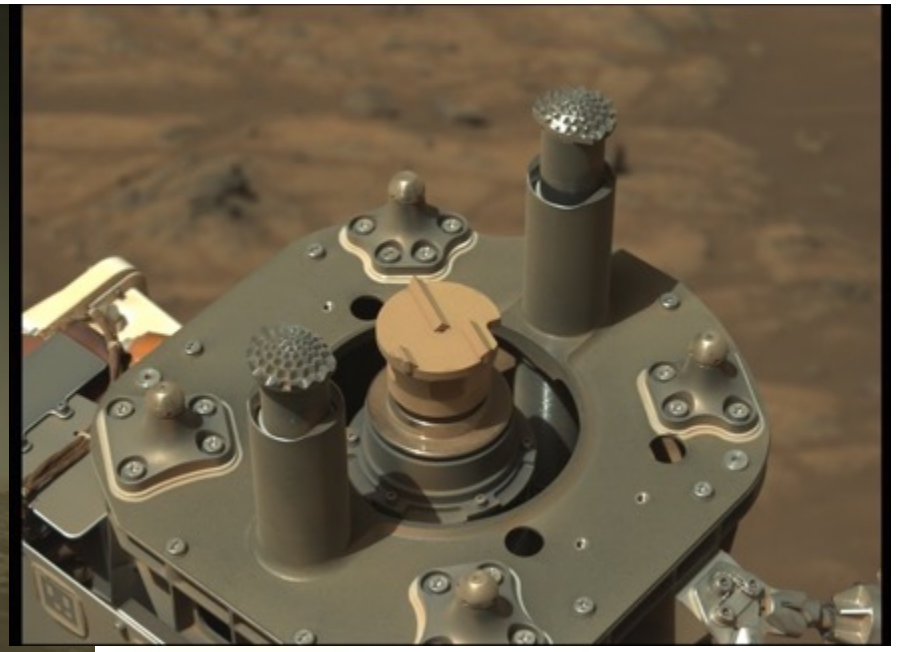
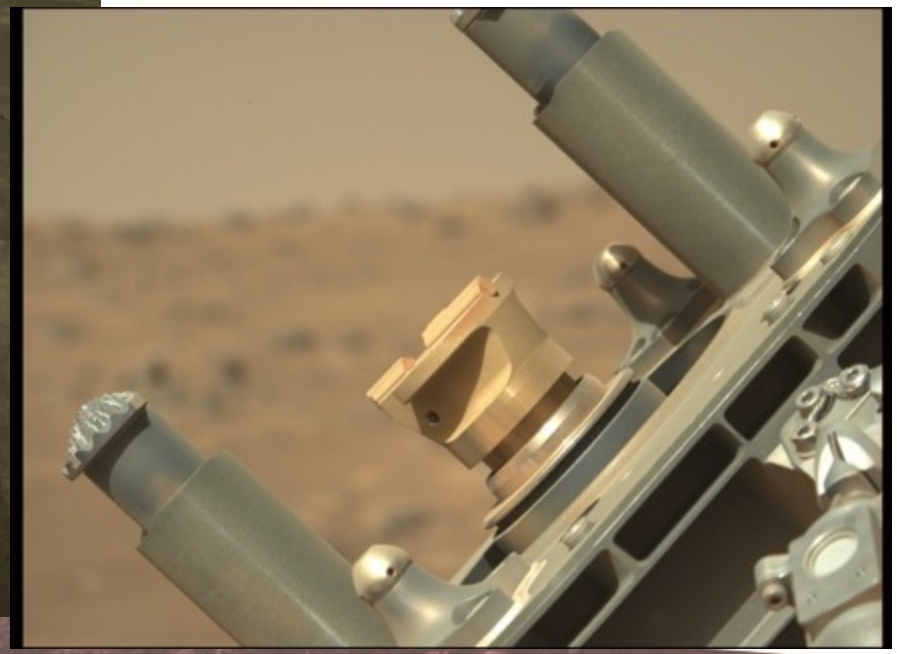
Images and information from https://mars.nasa.gov/mars2020/

The abrasion bit attached to the drill at the end of the arm on the Perseverance Rover





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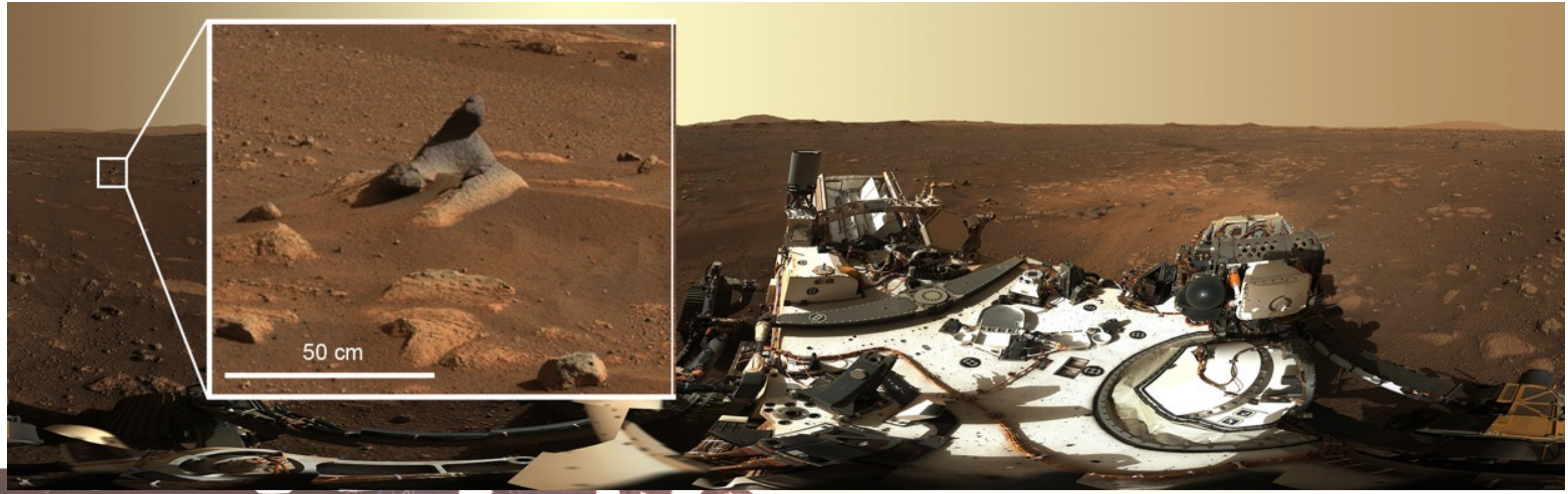
Images and information from https://mars.nasa.gov/mars2020/

First 360-degree panorama taken by Mastcam-Z on sol 3, the third Martian day of the Perseverance Rover mission (February 21, 2021)



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Images and information from https://mars.nasa.gov/mars2020/

Deployment of the Ingenuity helicopter by the Perseverance Rover

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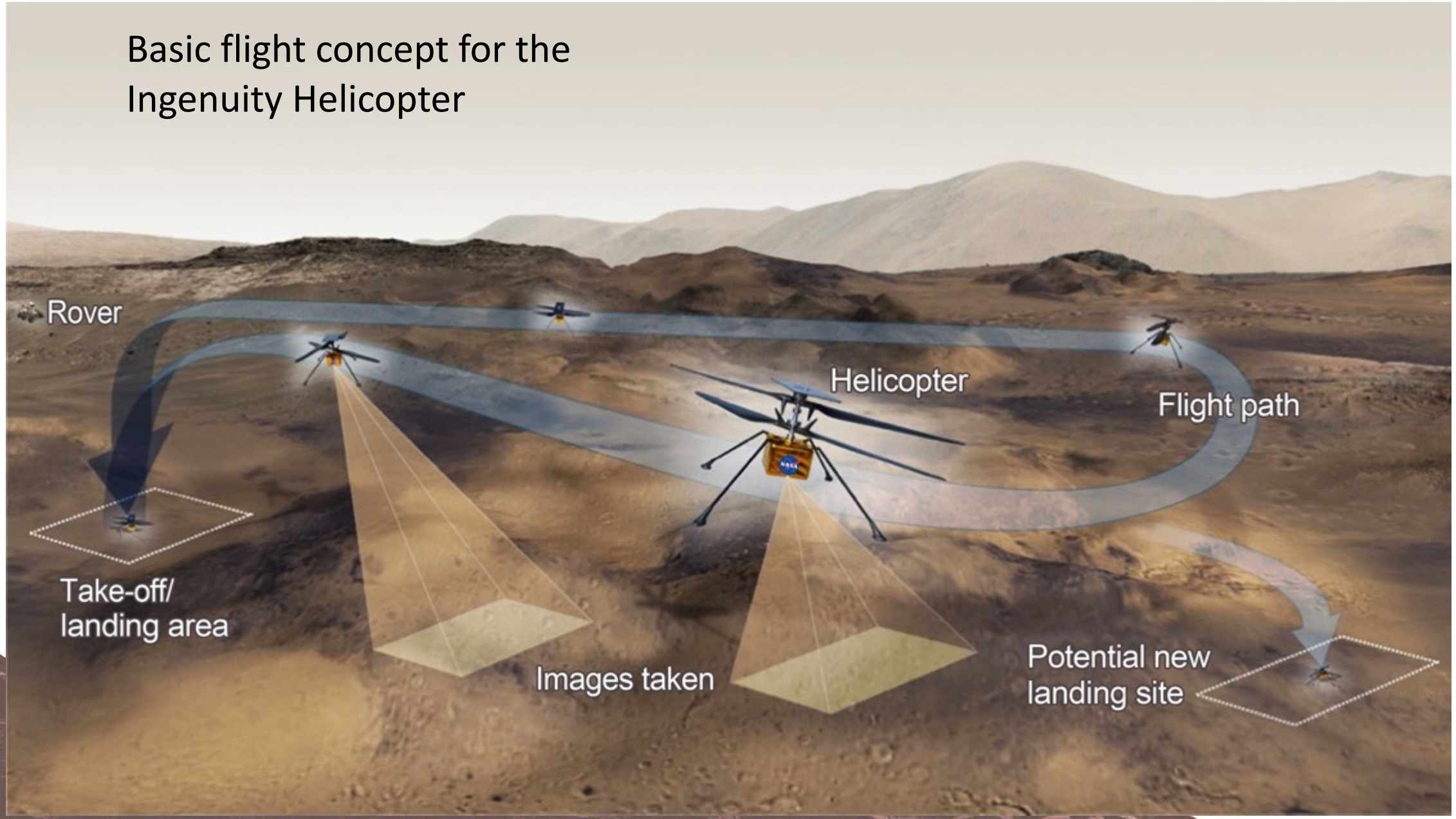
Images and information from https://mars.nasa.gov/mars2020/

Basic flight concept for the Ingenuity Helicopter



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Images and information from https://mars.nasa.gov/mars2020/

Ingenuity Helicopter sitting on the Martian surface

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Images and information from https://mars.nasa.gov/mars2020/

First flight test of the Ingenuity Helicopter on Mars

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Images and information from https://mars.nasa.gov/mars2020/

The Ingenuity Helicopter sitting alone on the Martian surface

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Images and information from https://mars.nasa.gov/mars2020/

The Ingenuity Helicopter in flight taken by Mastcam-Z on the Perseverance Rover

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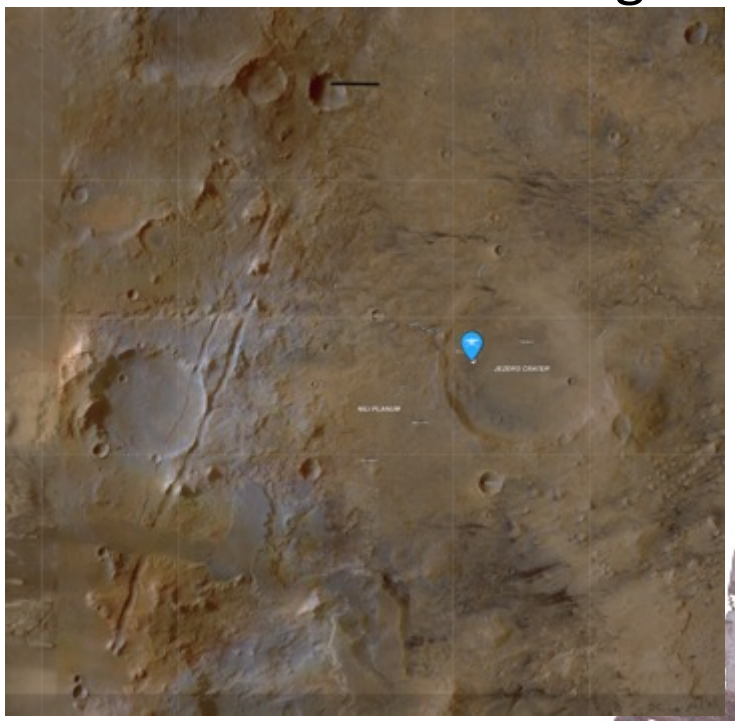
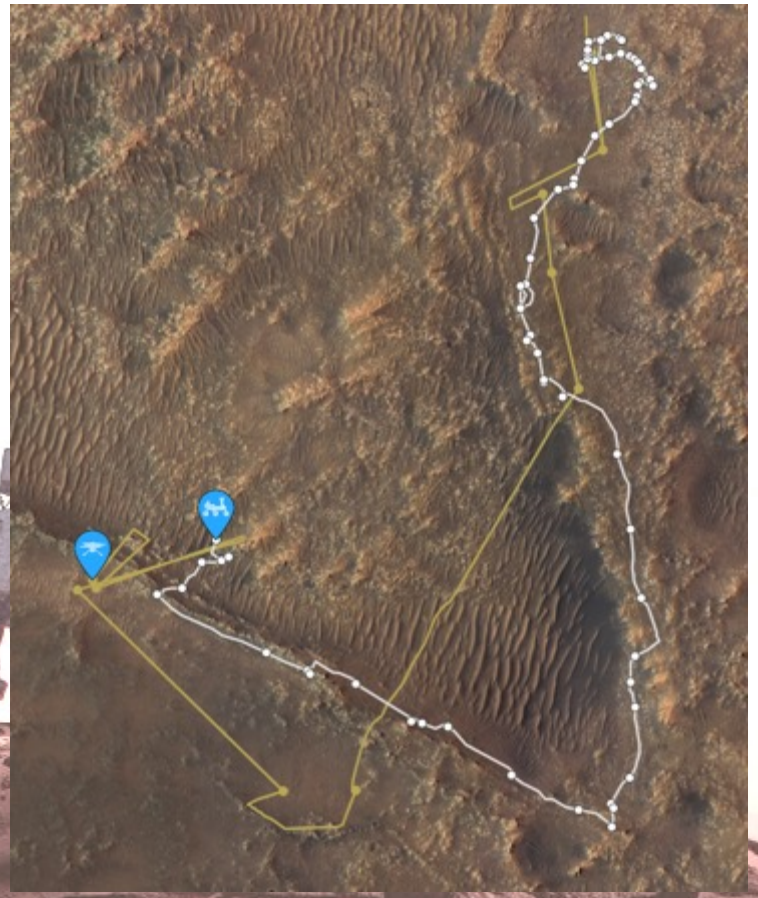
Images and information from https://mars.nasa.gov/mars2020/

Location of the Perseverance rover and Ingenuity helicopter after 210 sols (ie. days) on Mars and the path they each traveled. Perseverance has driven 1.62 miles (2.61 km). Ingenuity has flown 13 times covering 1.79 miles (2.88 km).





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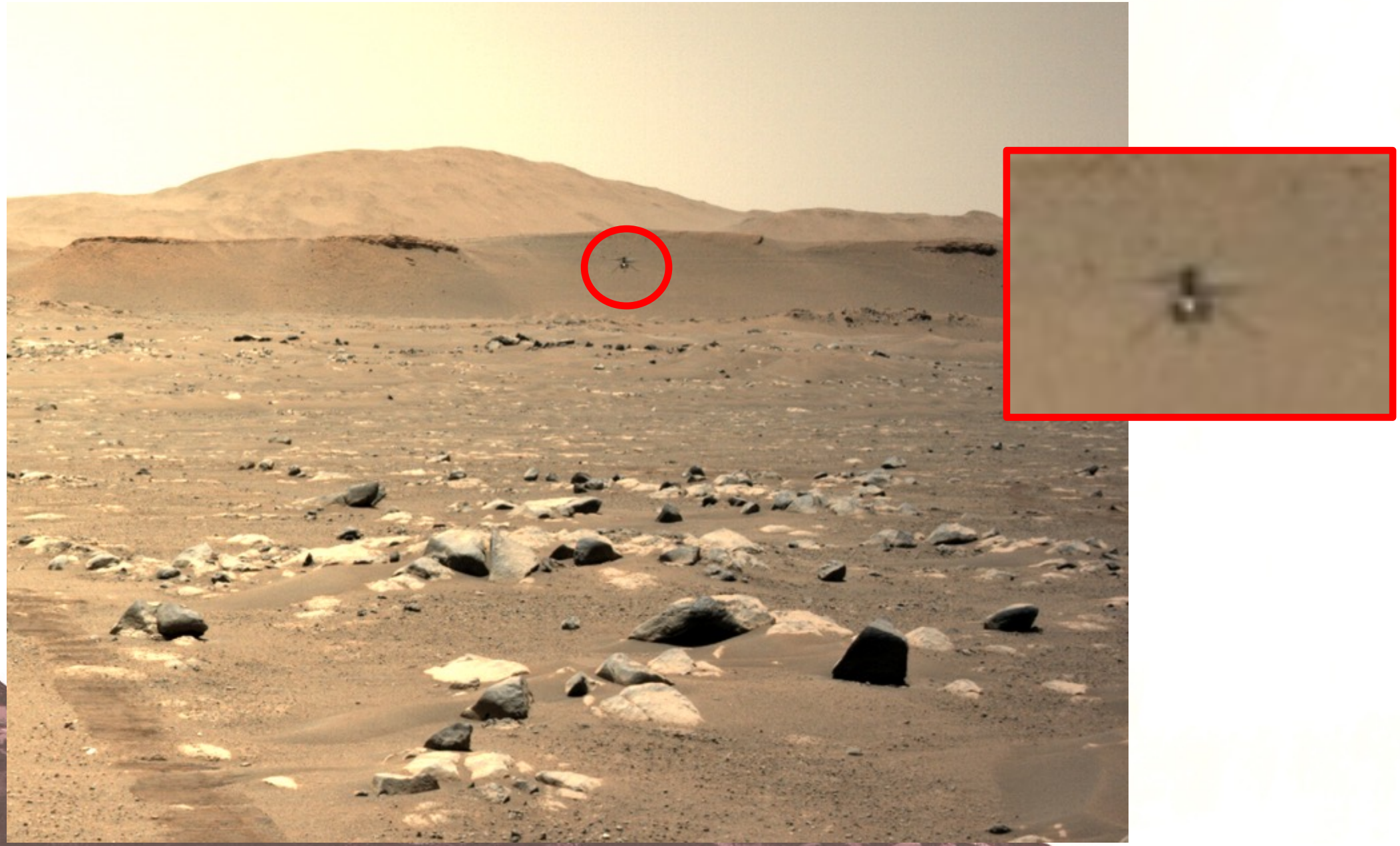
Images and information from https://mars.nasa.gov/mars2020/

The Ingenuity Helicopter in flight. Image taken by Mastcam-Z on the Perseverance Rover



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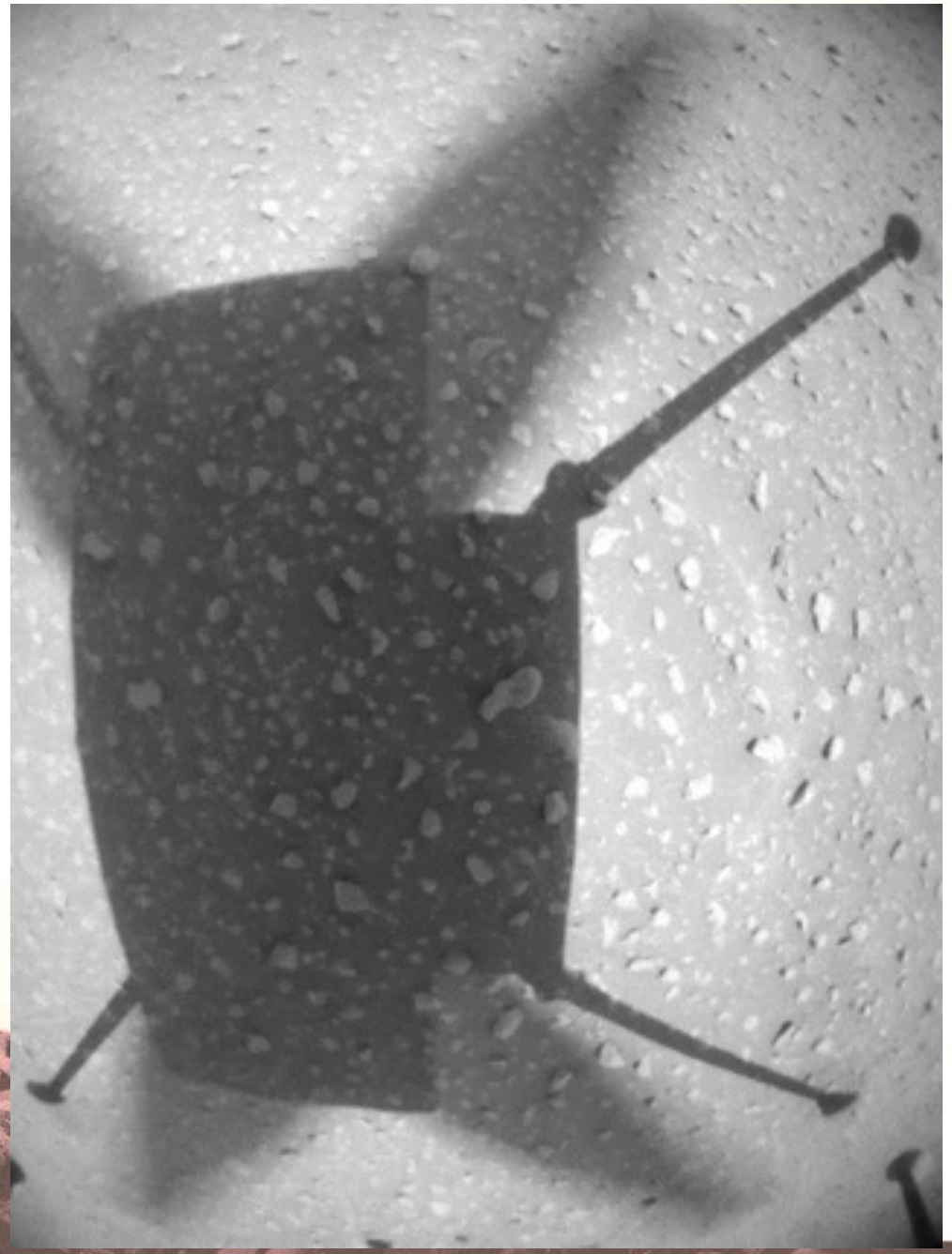
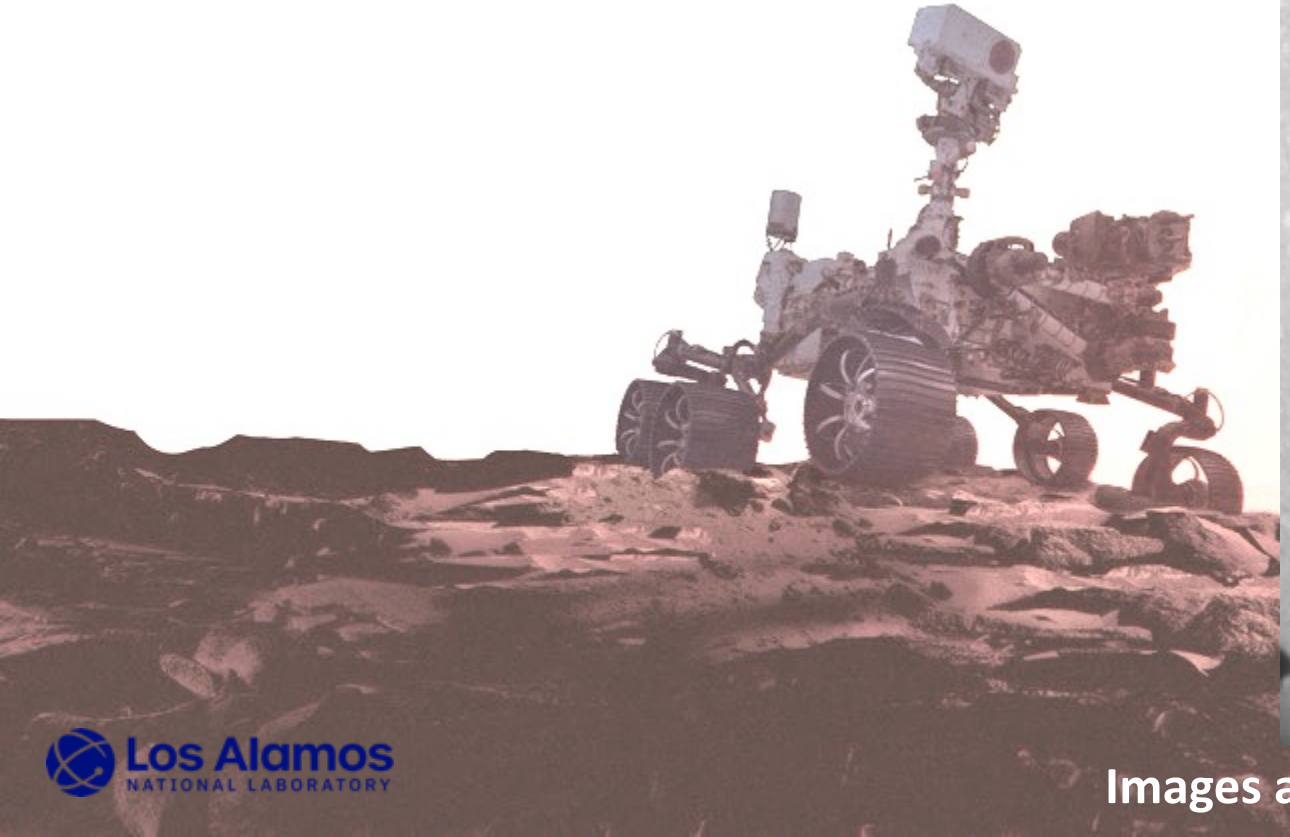
Images and information from https://mars.nasa.gov/mars2020/

The shadow of the Ingenuity Helicopter taken in flight by the helicopter using its downward terrain imaging camera





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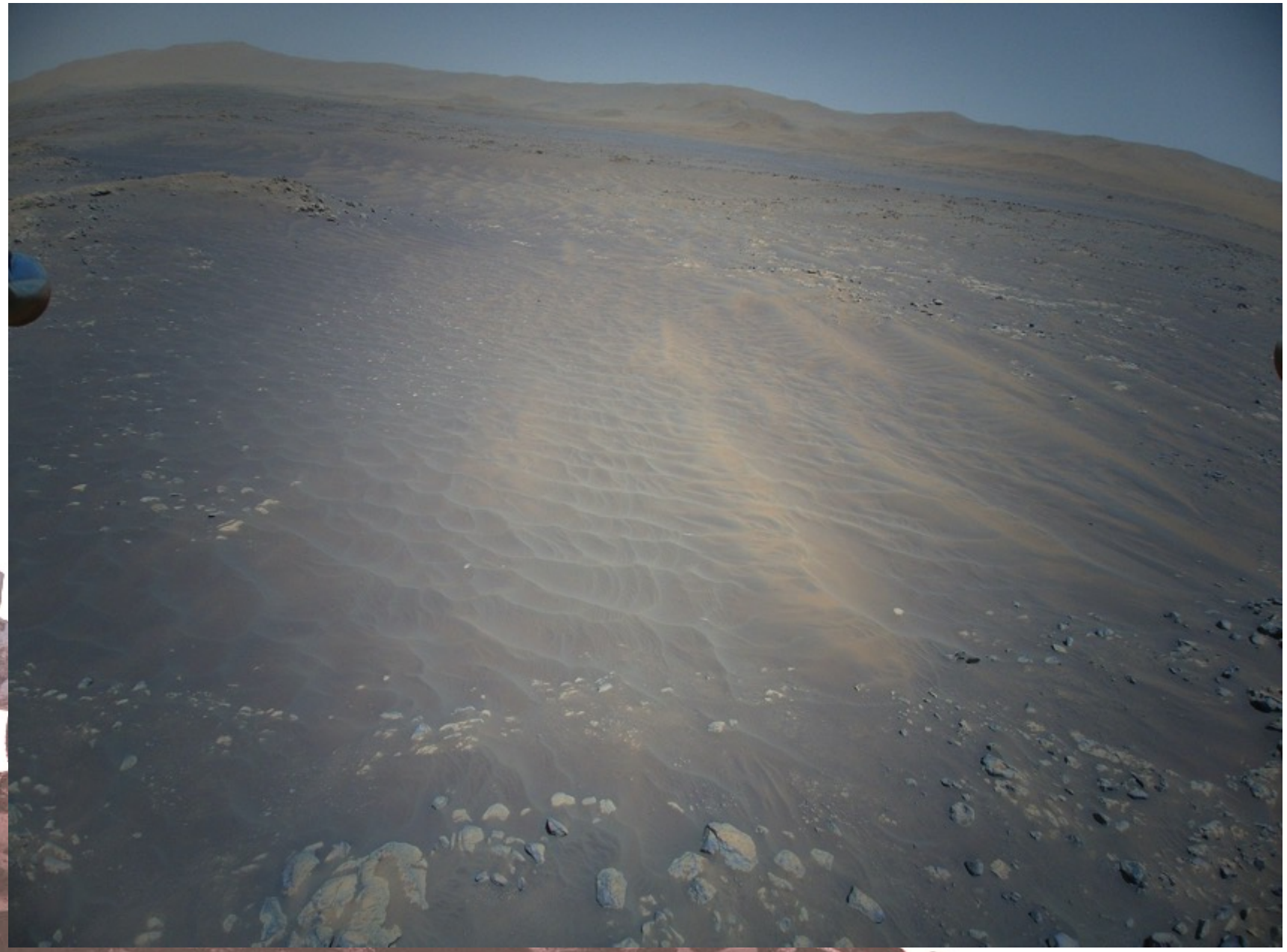
Images and information from https://mars.nasa.gov/mars2020/

The surface of Mars imaged by the Ingenuity Helicopter while in flight



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Images and information from https://mars.nasa.gov/mars2020/

Large rock sitting on the surface of Mars that caused the mission scientists to ask “why are there holes in the rock and how did they form?” Image taken by Mastcam-Z on the Perseverance Rover.

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Images and information from https://mars.nasa.gov/mars2020/

Wheel tracks left by the Perseverance Rover. Using its auto-navigation driving mode the rover detected and drove around a large rock. Image taken by the Rear-Hazcam on the rover.

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Images and information from https://mars.nasa.gov/mars2020/

Large rock on the surface of Mars that has cracked apart. Cracks in rocks are likely caused by thermal stress due to extreme day-night temperature changes. Image taken by the Perseverance Rover

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Images and information from https://mars.nasa.gov/mars2020/

A dust devil on the surface of Mars taken by the Perseverance Rover

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Images and information from https://mars.nasa.gov/mars2020/

An image of the Martian landscape taken by the Perseverance Rover

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Images and information from https://mars.nasa.gov/mars2020/

An image of the Martian landscape taken by the Perseverance Rover

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Images and information from https://mars.nasa.gov/mars2020/

The Martian dunes made up of fine-grain soil. Image taken by the Perseverance Rover

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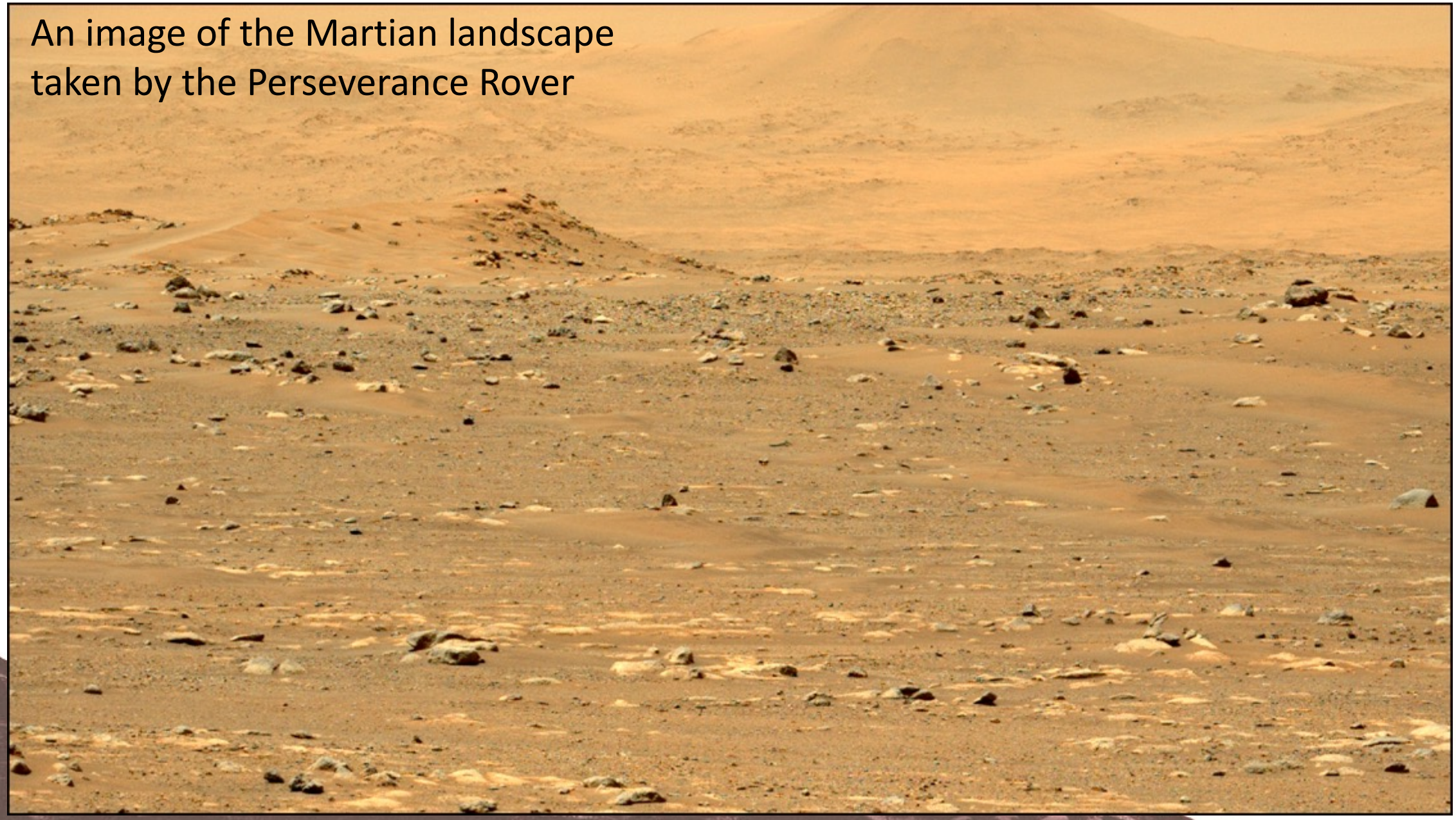
Images and information from https://mars.nasa.gov/mars2020/

An image of the Martian landscape taken by the Perseverance Rover



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Images and information from https://mars.nasa.gov/mars2020/

The edge of Jezero Crater forming the horizon

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Images and information from https://mars.nasa.gov/mars2020/

Martian rocks shaped over billions of years

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Images and information from https://mars.nasa.gov/mars2020/

The Perseverance Rover collecting science data using the instruments mounted on the end of its robotic arm

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Images and information from https://mars.nasa.gov/mars2020/

Raw image of the Kodiak delta remnant taken by Mastcam-Z on the Perseverance Rover

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Images and information from https://mars.nasa.gov/mars2020/

Enhanced image of the Kodiak delta remnant taken by Mastcam-Z on the Perseverance Rover

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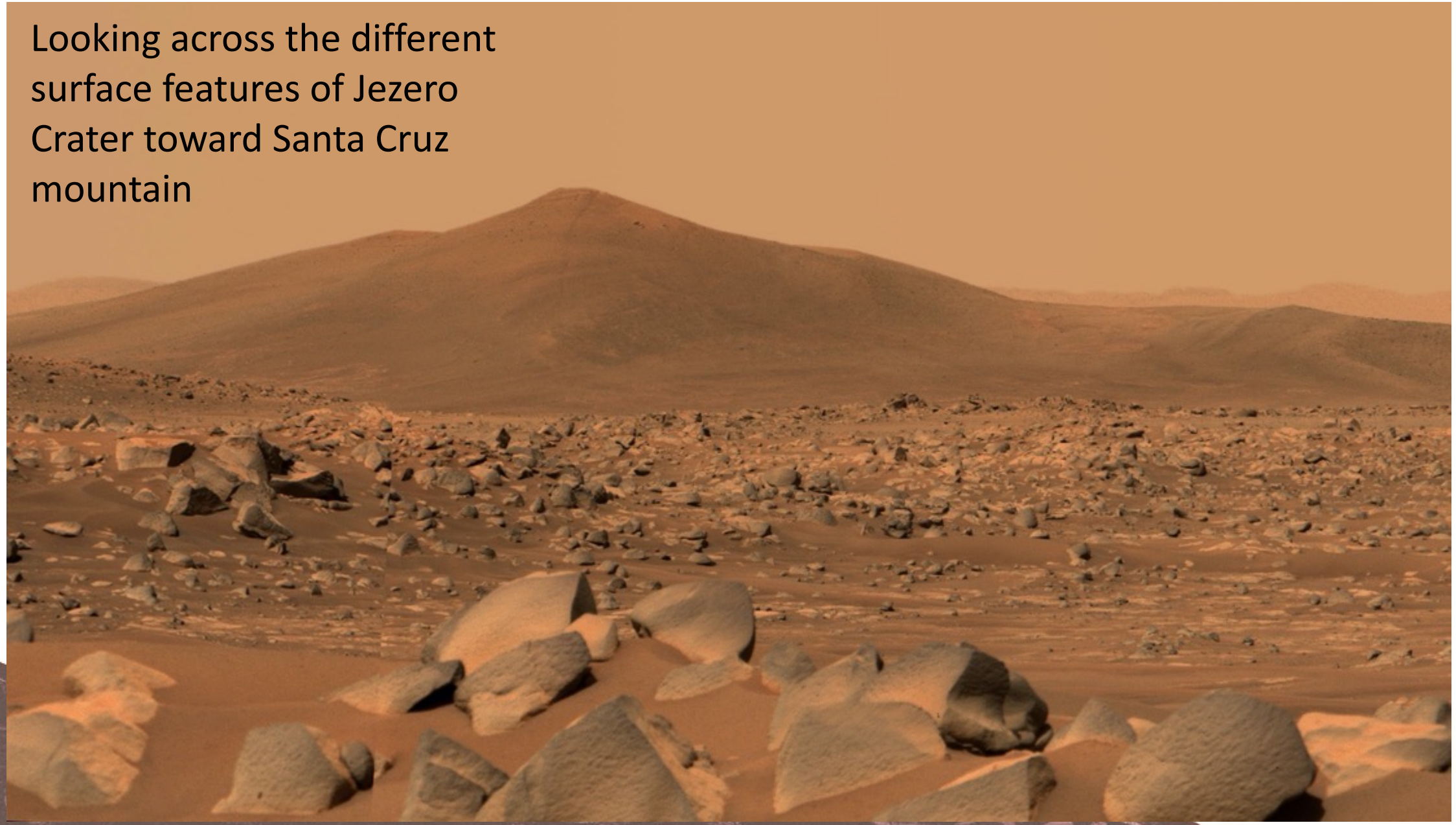
Images and information from https://mars.nasa.gov/mars2020/

Looking across the different surface features of Jezero Crater toward Santa Cruz mountain



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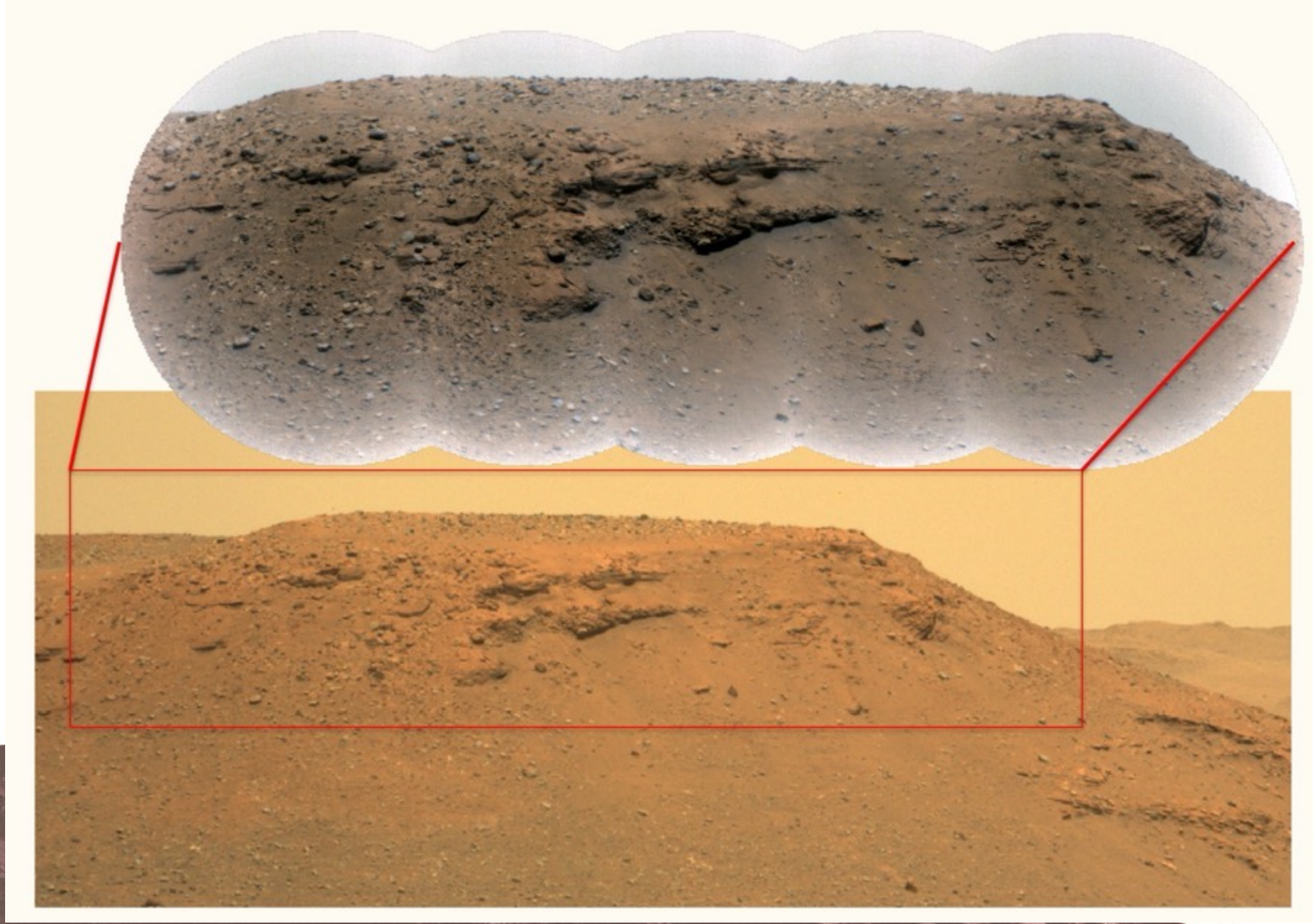
Images and information from https://mars.nasa.gov/mars2020/

A Mastcam-Z image of the Jezero Crater Delta Scarp with a SuperCam mosaic overlaid



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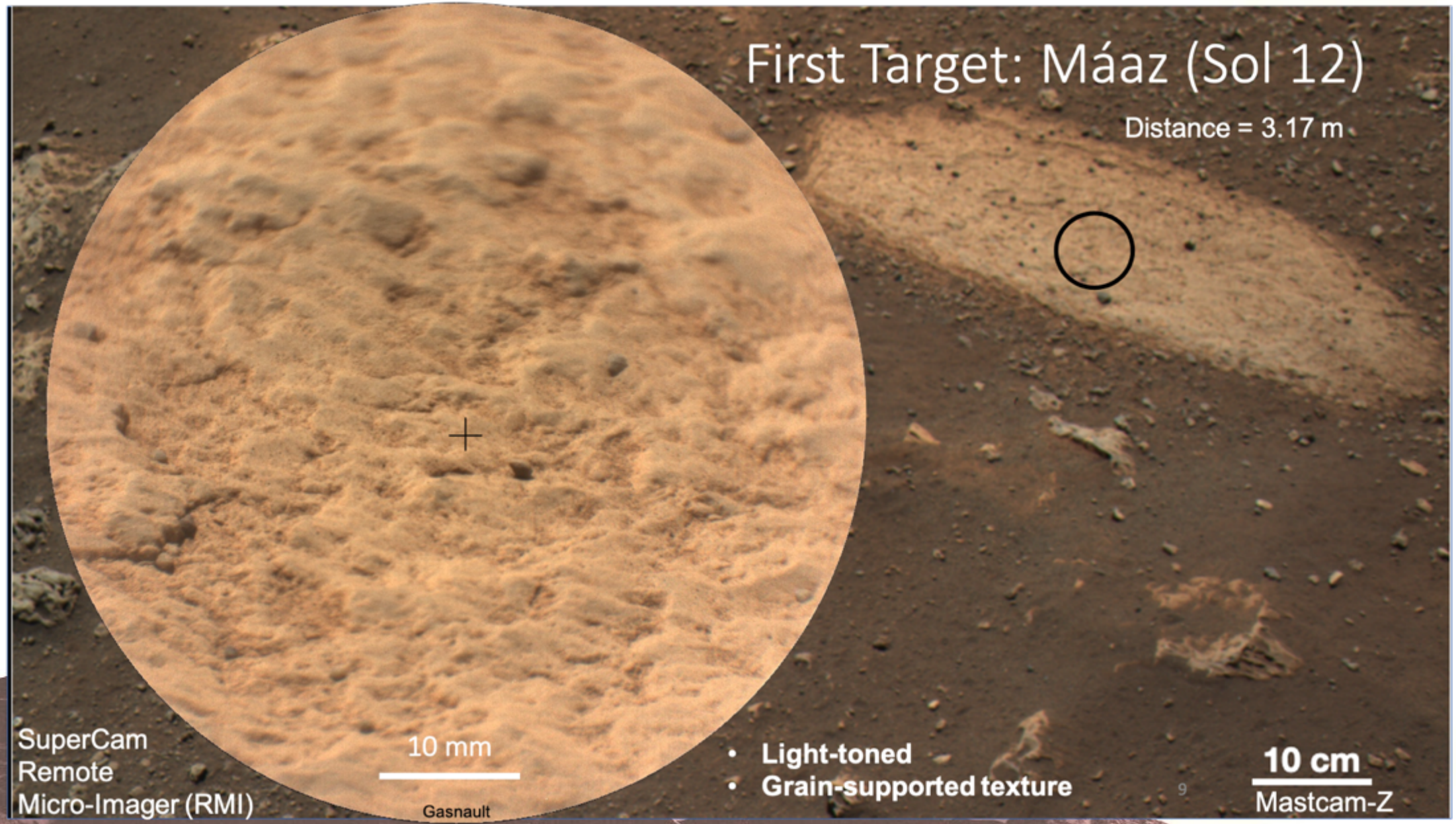
Images and information from https://mars.nasa.gov/mars2020/



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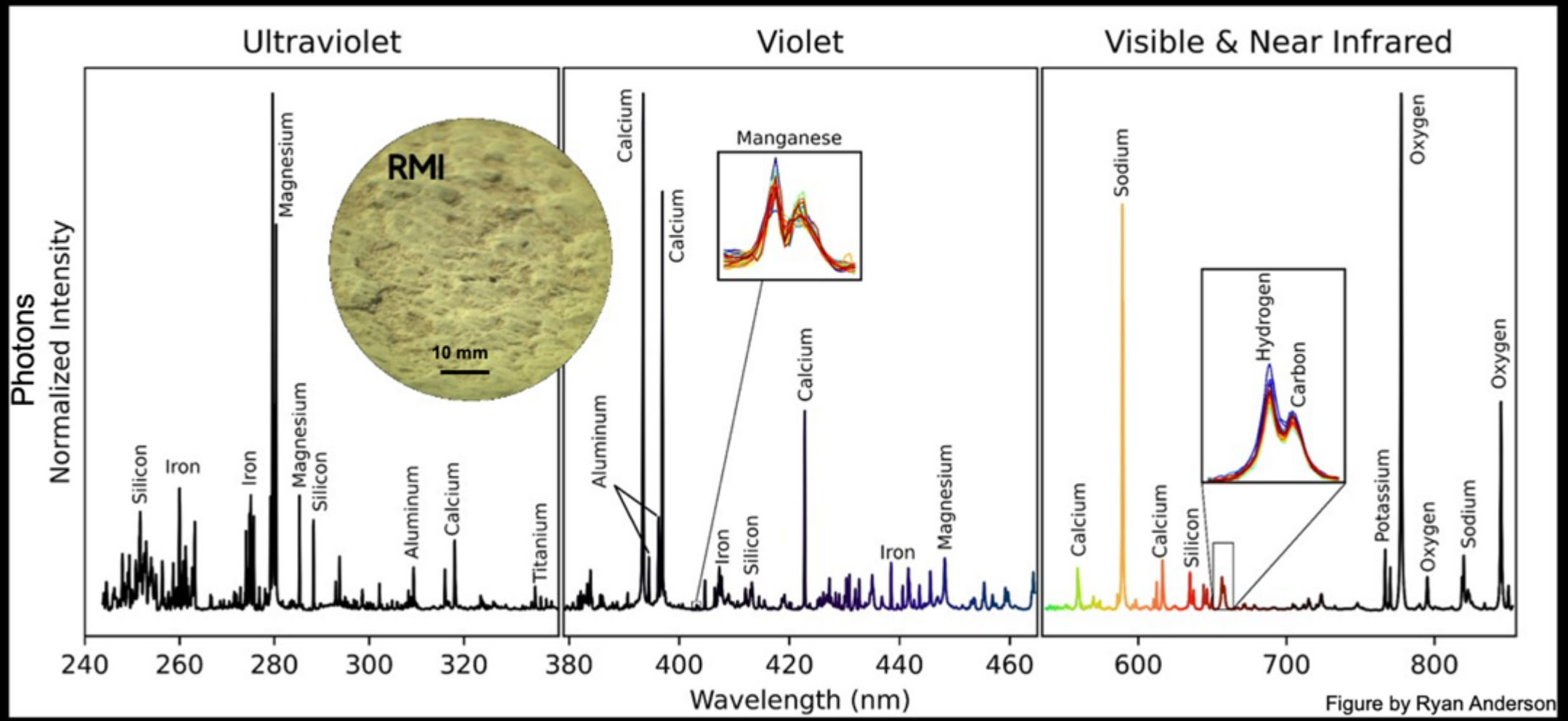
Images and information from LA-UR-21-21261

Maaz target (Sol 12)

1st SuperCam LIBS spectrum



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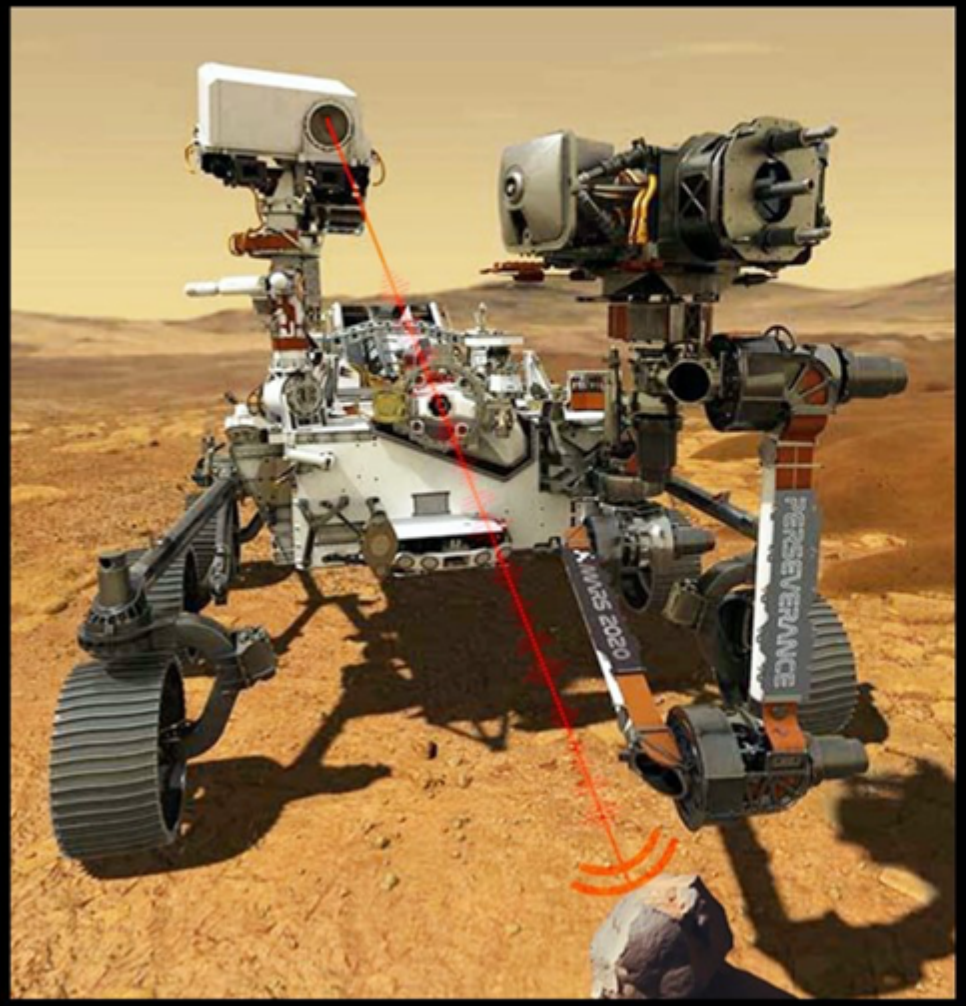
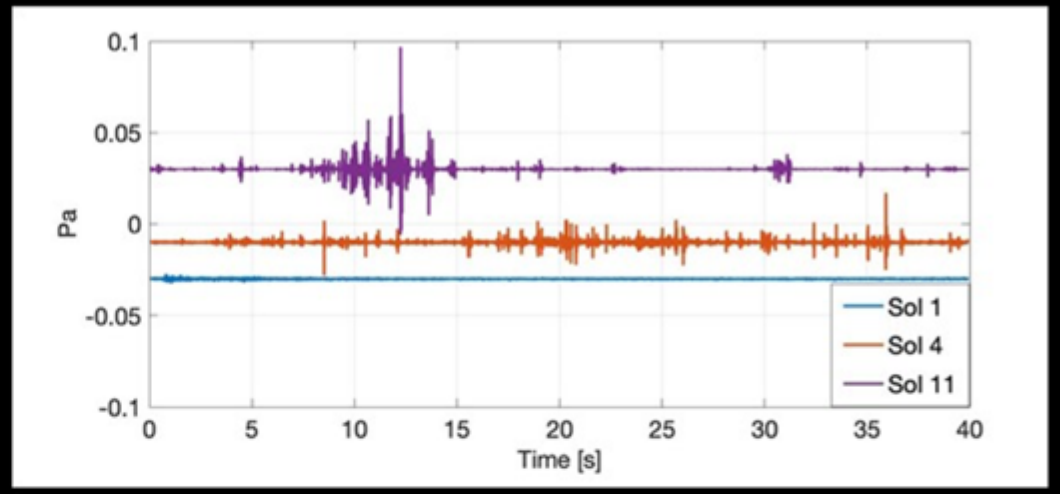
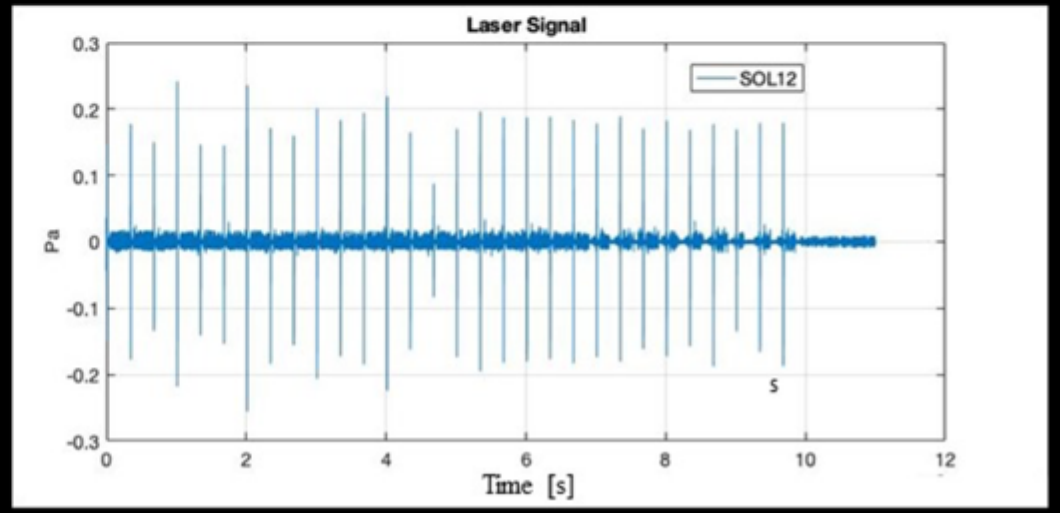
Images and information from LA-UR-21-21261

Martian acoustics





Sol 1: First recording of sounds on Mars
Sol 4: First acoustic recording of the wind
Sol 12: First recording of laser shots



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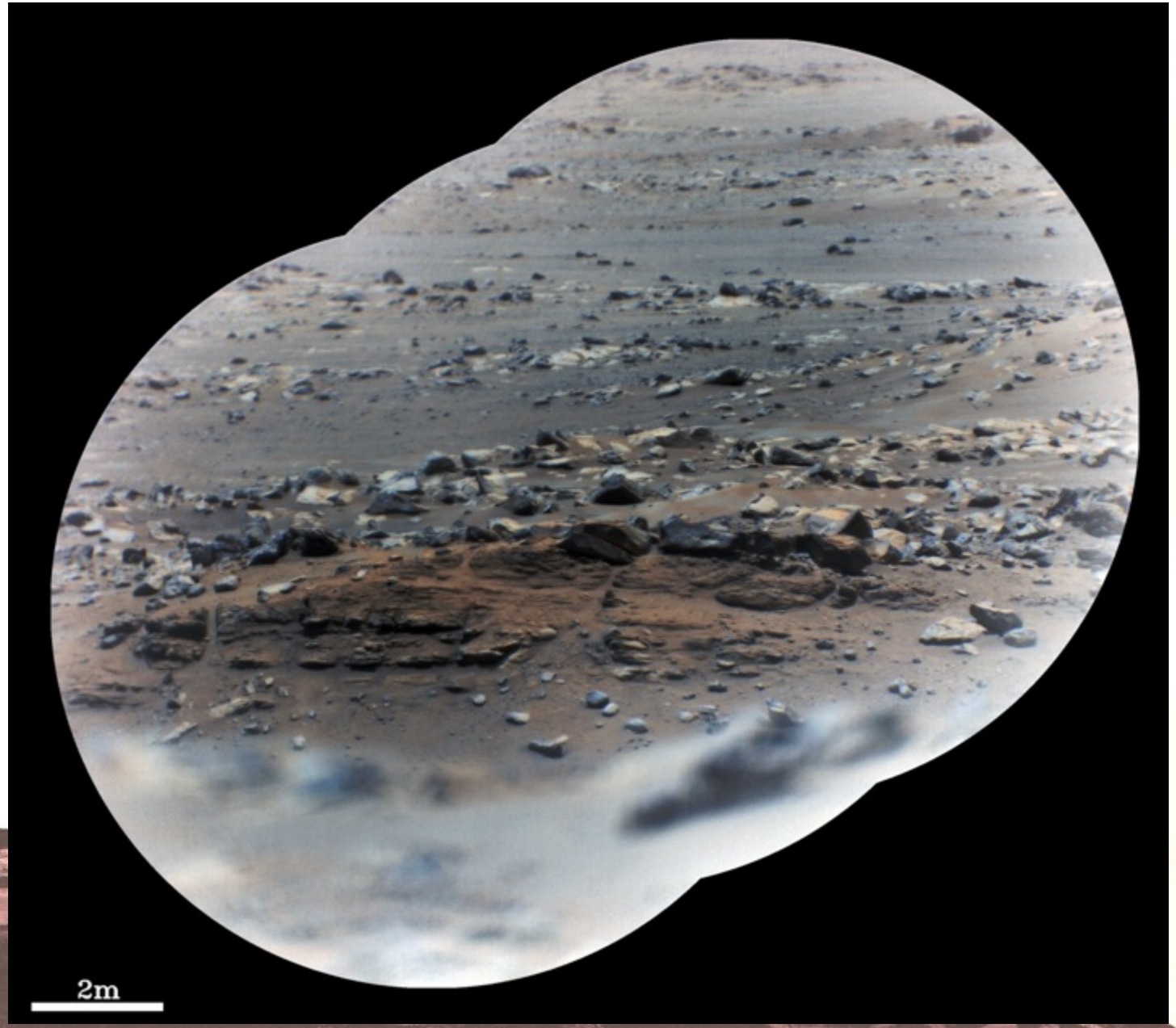
Images and information from LA-UR-21-21261

SuperCam mosaic of a layered rock outcrop



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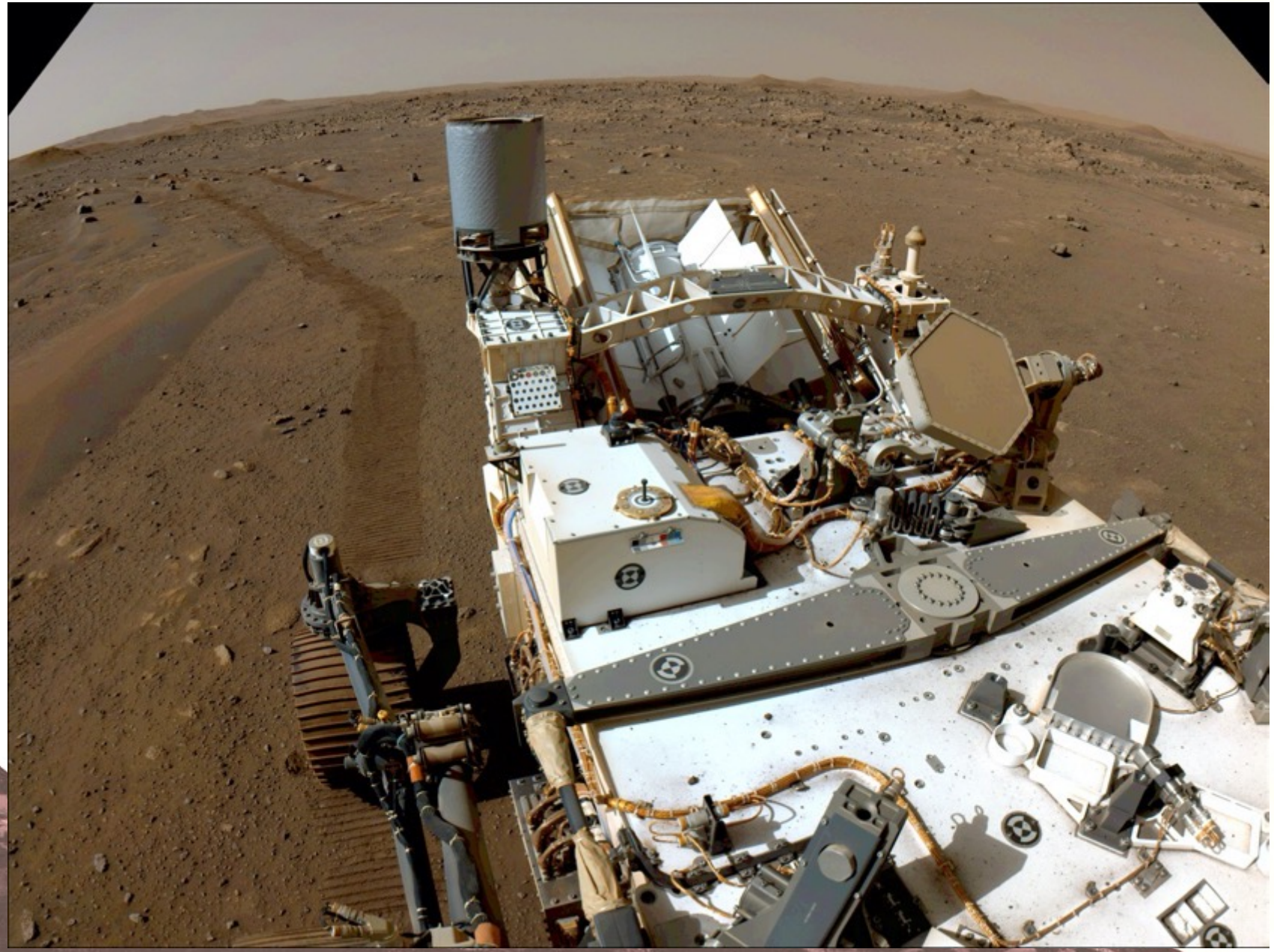
Images and information from https://mars.nasa.gov/mars2020/

The Perseverance Rover making tracks on Mars



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Images and information from https://mars.nasa.gov/mars2020/

A gust of wind sweeping dust across the Martian plain of Jezero Crater

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Images and information from https://mars.nasa.gov/mars2020/

The WATSON camera zooming in on a Martian rock. The darker colored region was cleared of dust by the SuperCam laser

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Images and information from https://mars.nasa.gov/mars2020/

A panorama of Jezero Crater taken by Mastcam-Z on the Perseverance Rover

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Images and information from https://mars.nasa.gov/mars2020/

Natural Color Image of the Martian surface

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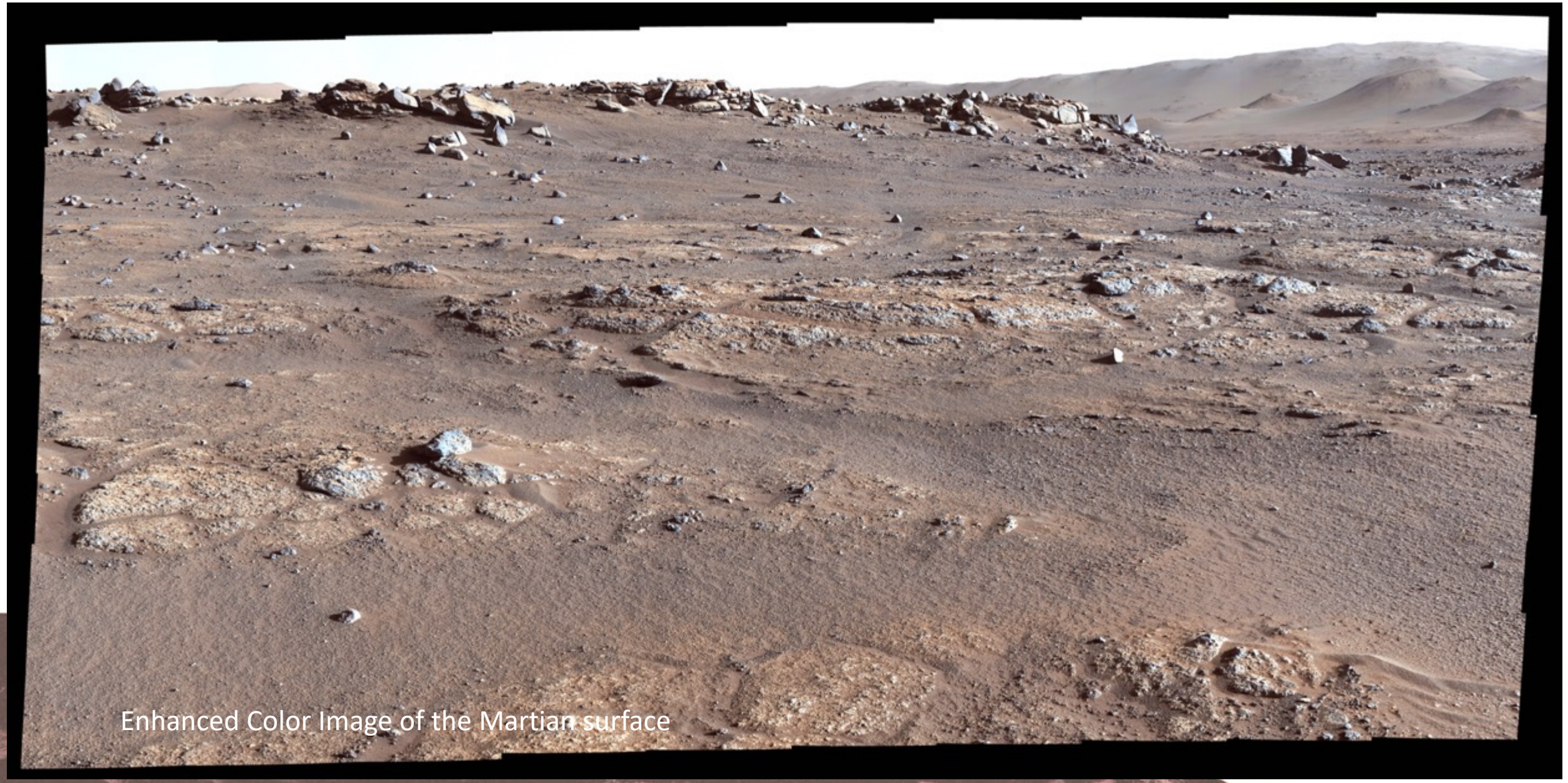

Enhanced Color Image of the Martian surface

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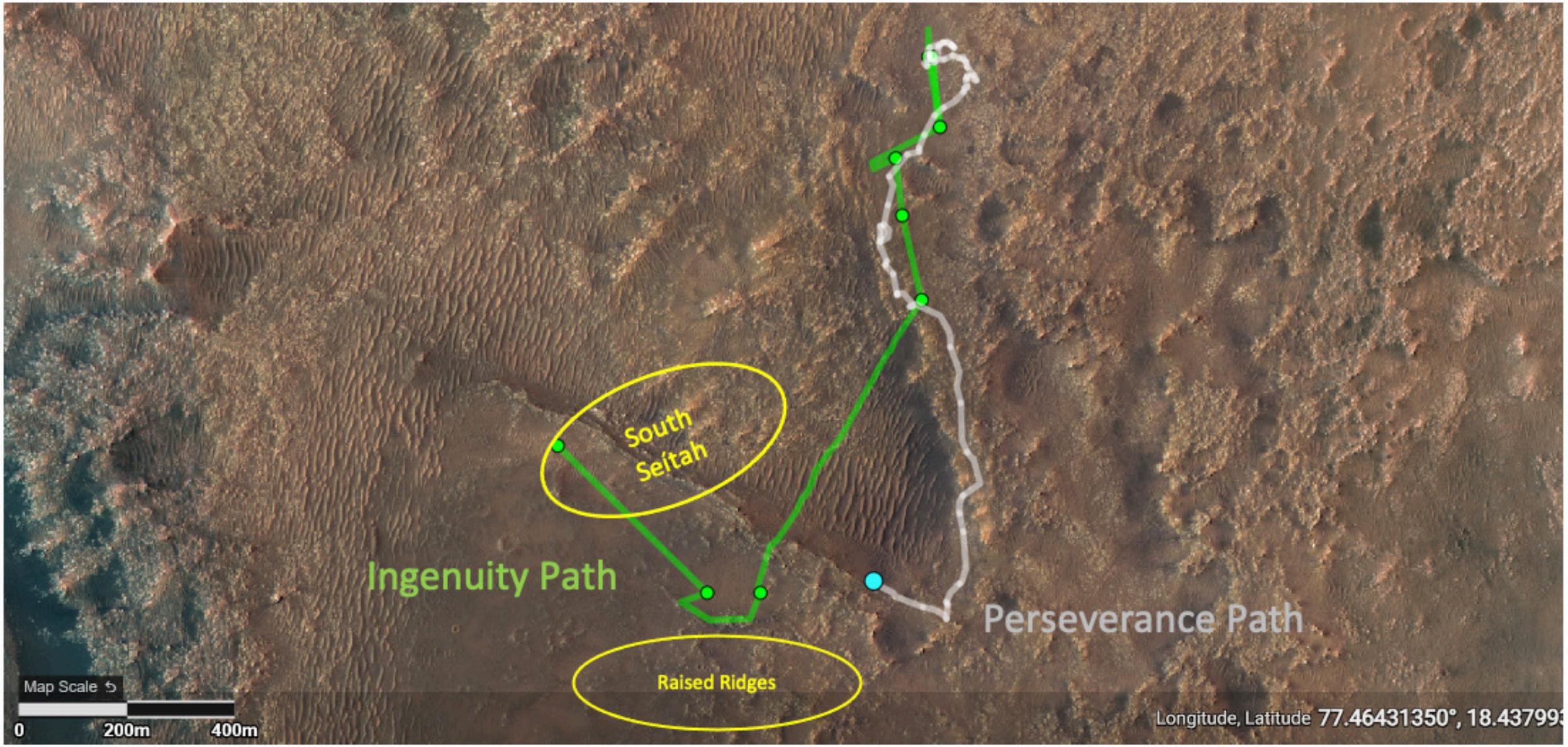
Images and information from https://mars.nasa.gov/mars2020/



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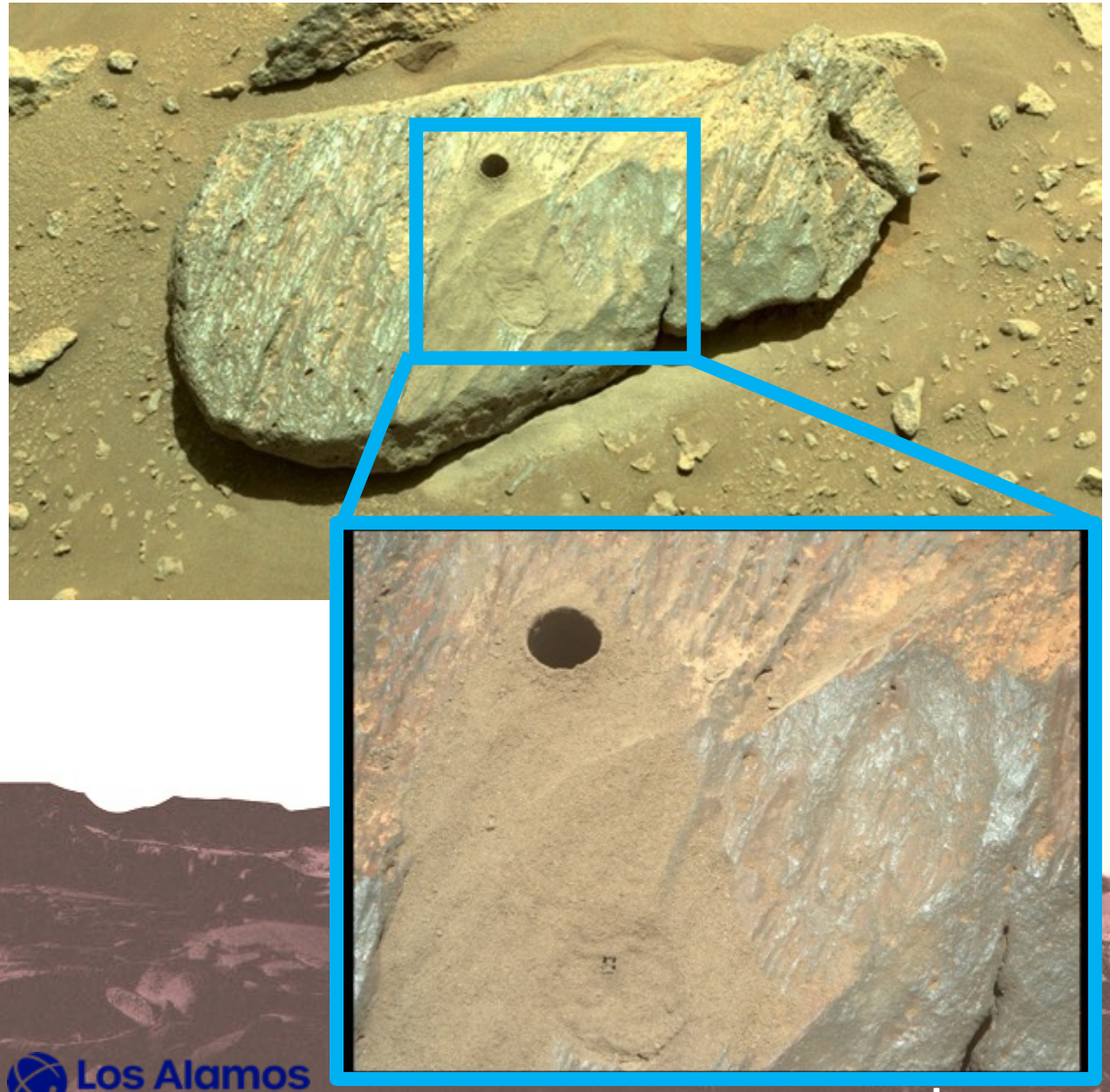
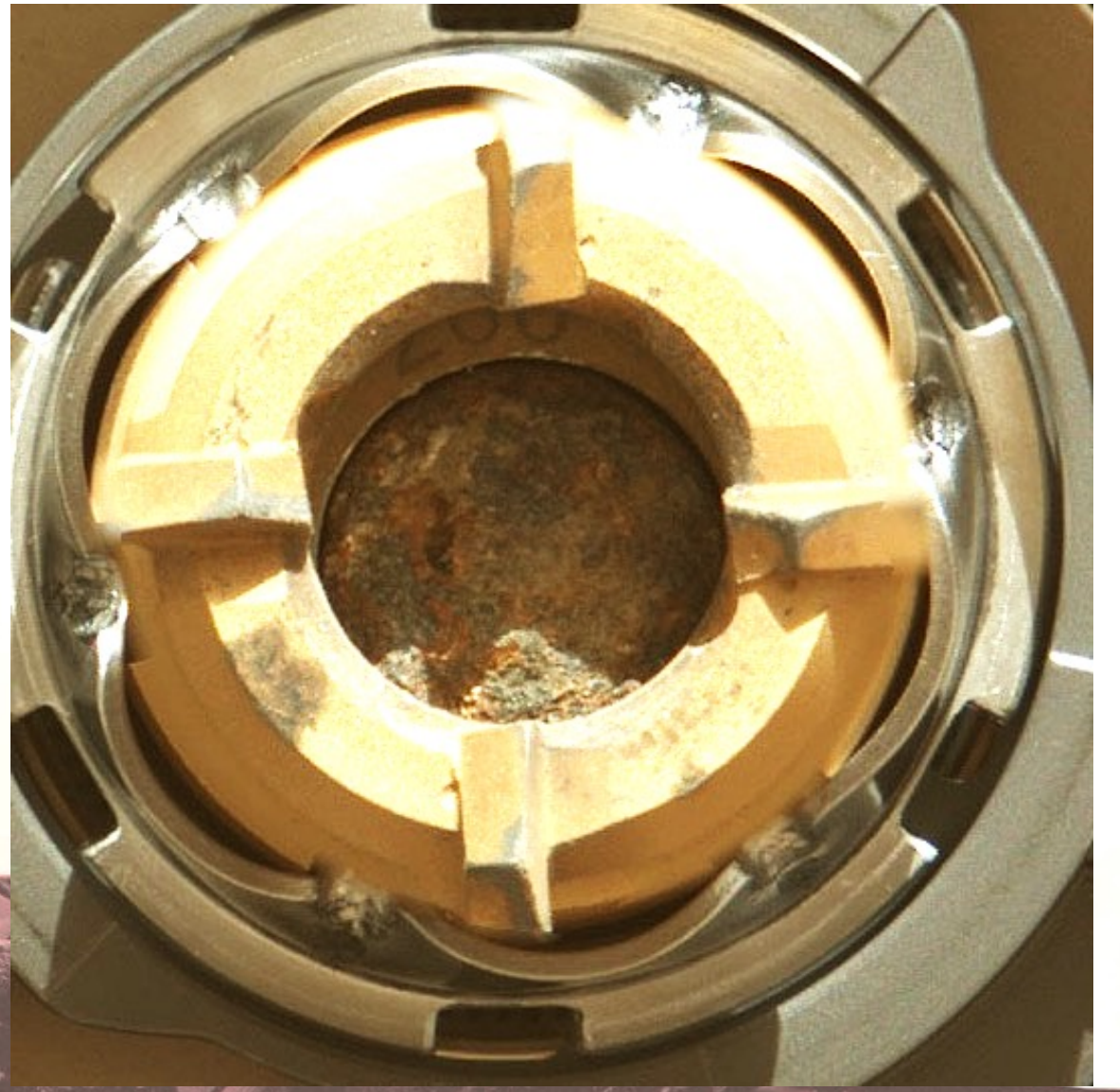
Hole left by Perseverance Rover's sampling drill



Rock core sample inside the drill bit



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Images and information from https://mars.nasa.gov/mars2020/

The hole left by the coring drill with 10 small ‘pits’ made by the SuperCam laser. SuperCam’s LIBS spectrometer uses a laser to vaporize a small amount of rock to generate a burst of light. By analyzing the light intensity at different wavelengths scientists are able to determine the elemental composition of the rock.

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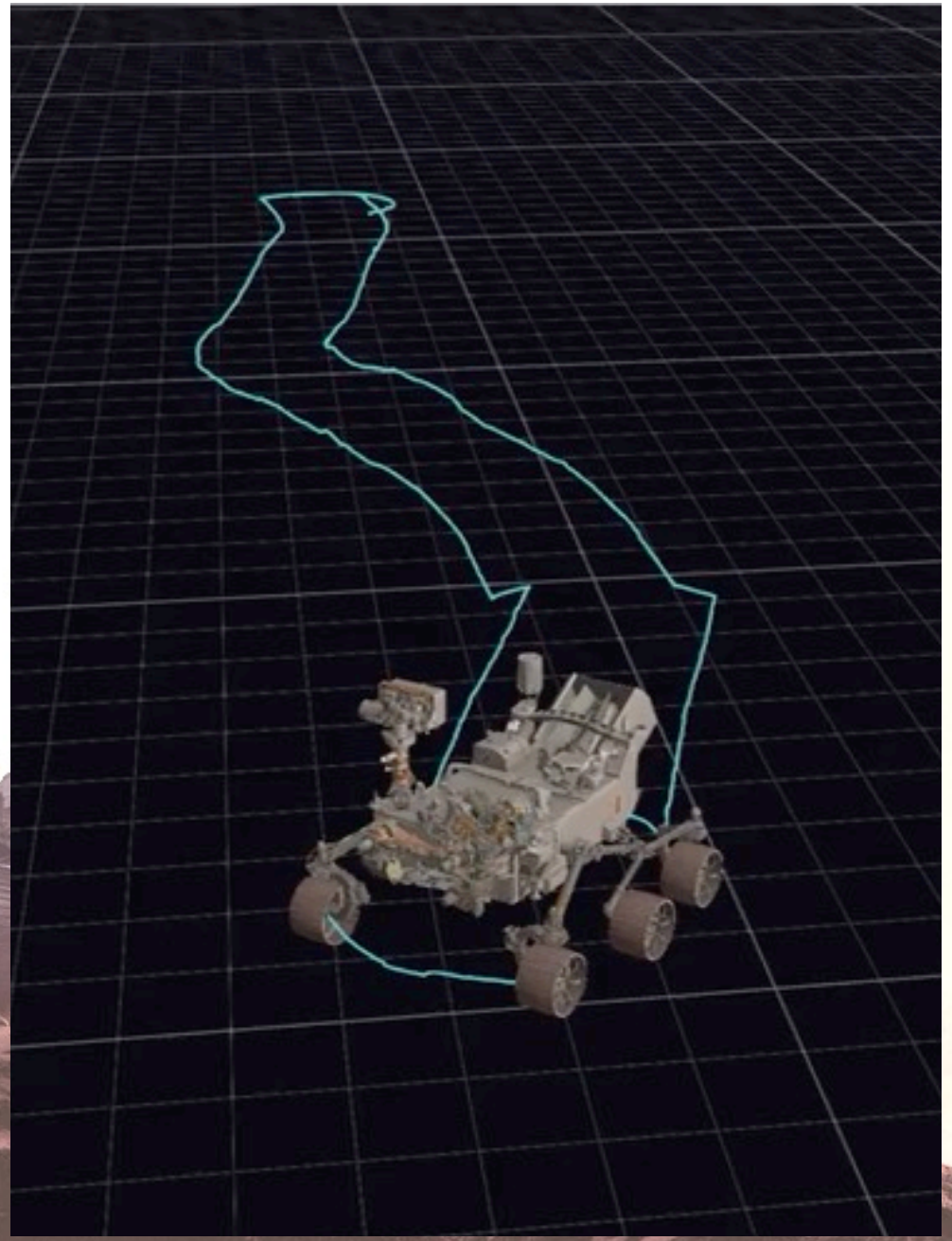
Images and information from https://mars.nasa.gov/mars2020/

Computer Simulation of Perseverance's First Auto-Navigation Drive



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Images and information from https://mars.nasa.gov/mars2020/

A view from the Perseverance Rover from on top of a small ridge inside Jezero Crater

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Images and information from https://mars.nasa.gov/mars2020/

Image of the Perseverance rover taken by the Ingenuity Helicopter while in flight

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Images and information from https://mars.nasa.gov/mars2020/

MastCam-Z image with a SuperCam Remote Micro Image overlay

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Images and information from https://mars.nasa.gov/mars2020/

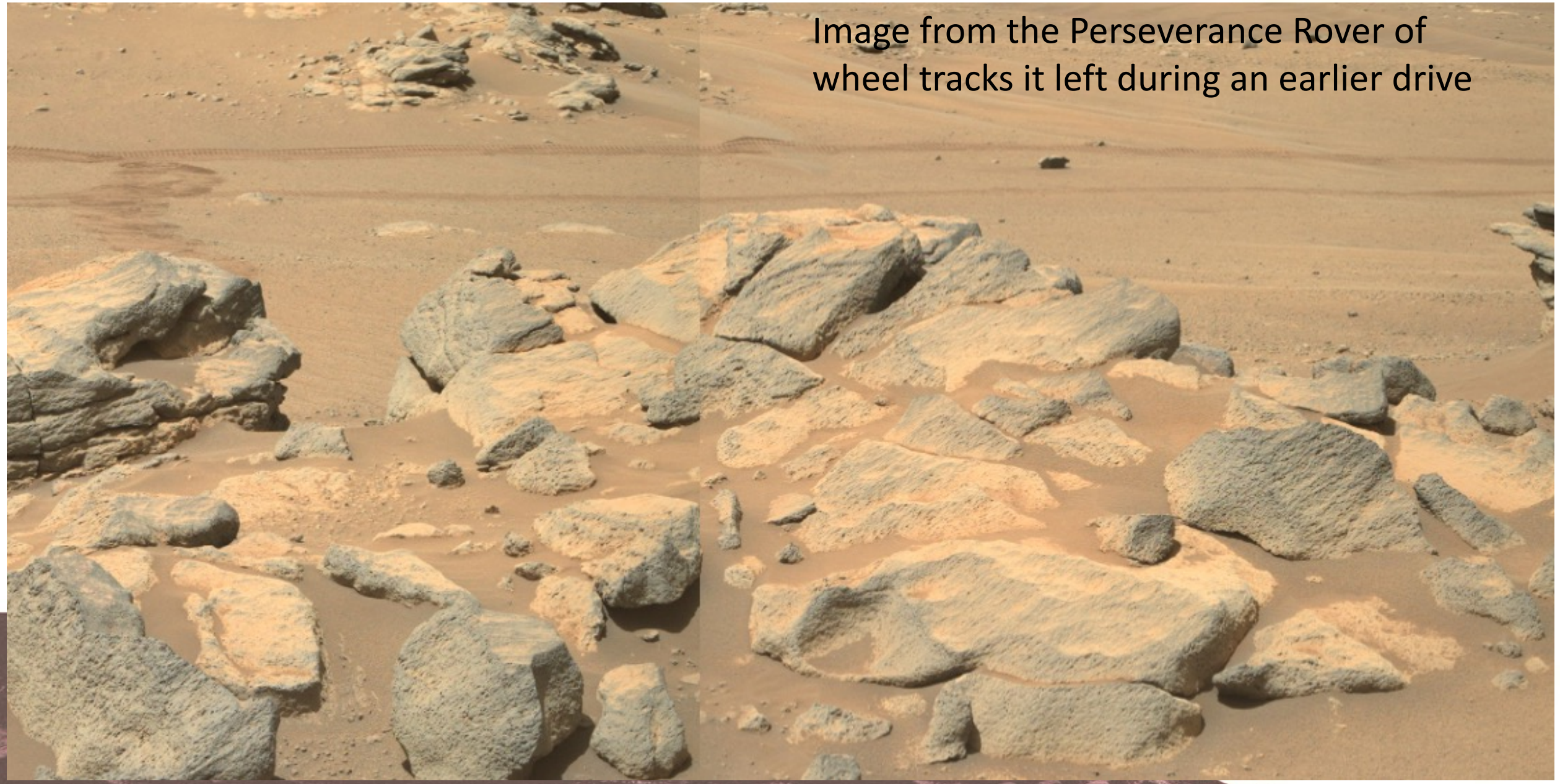

Image from the Perseverance Rover of wheel tracks it left during an earlier drive

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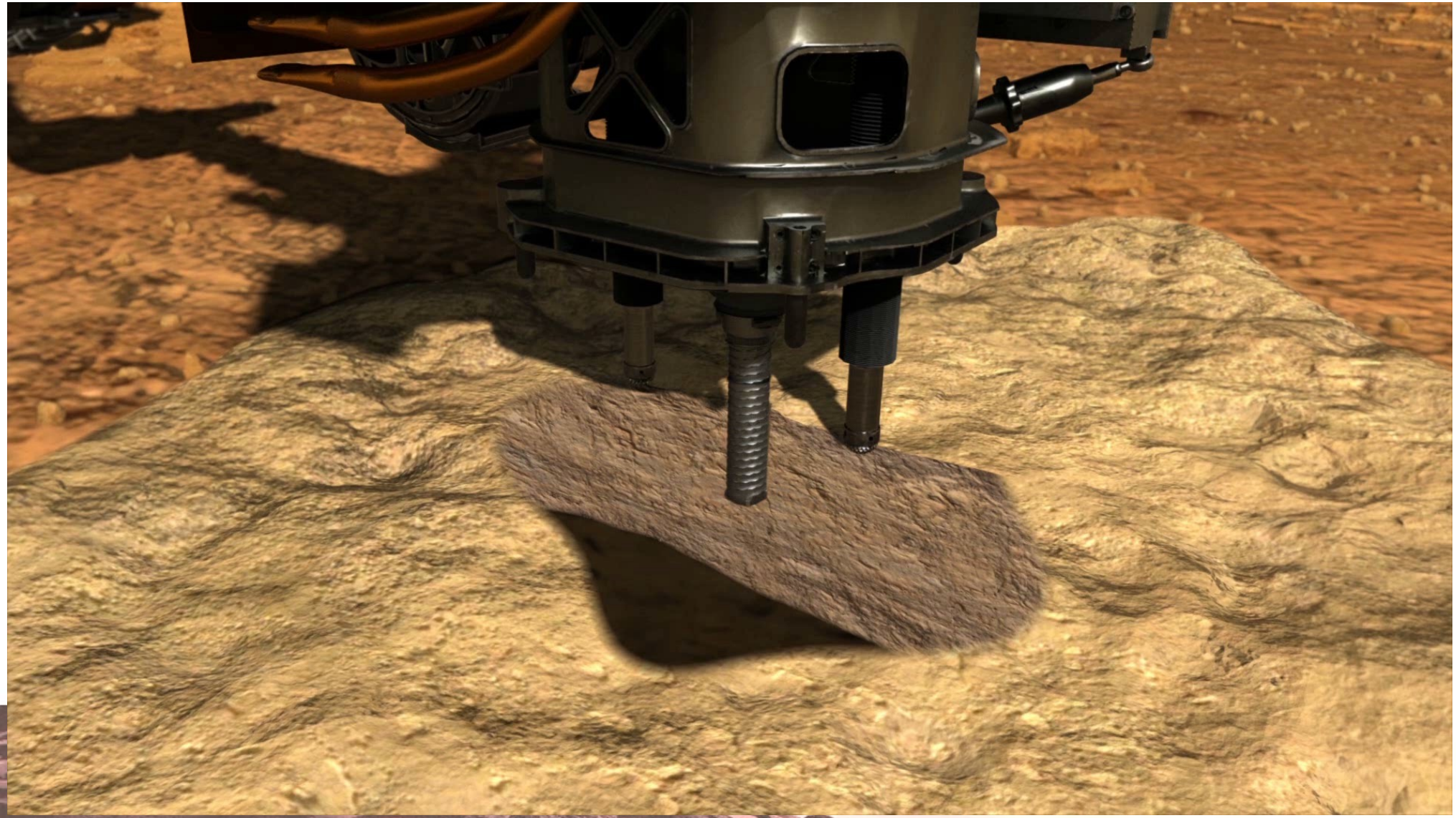
Images and information from https://mars.nasa.gov/mars2020/

Animation of how the Perseverance Rover collects a rock sample



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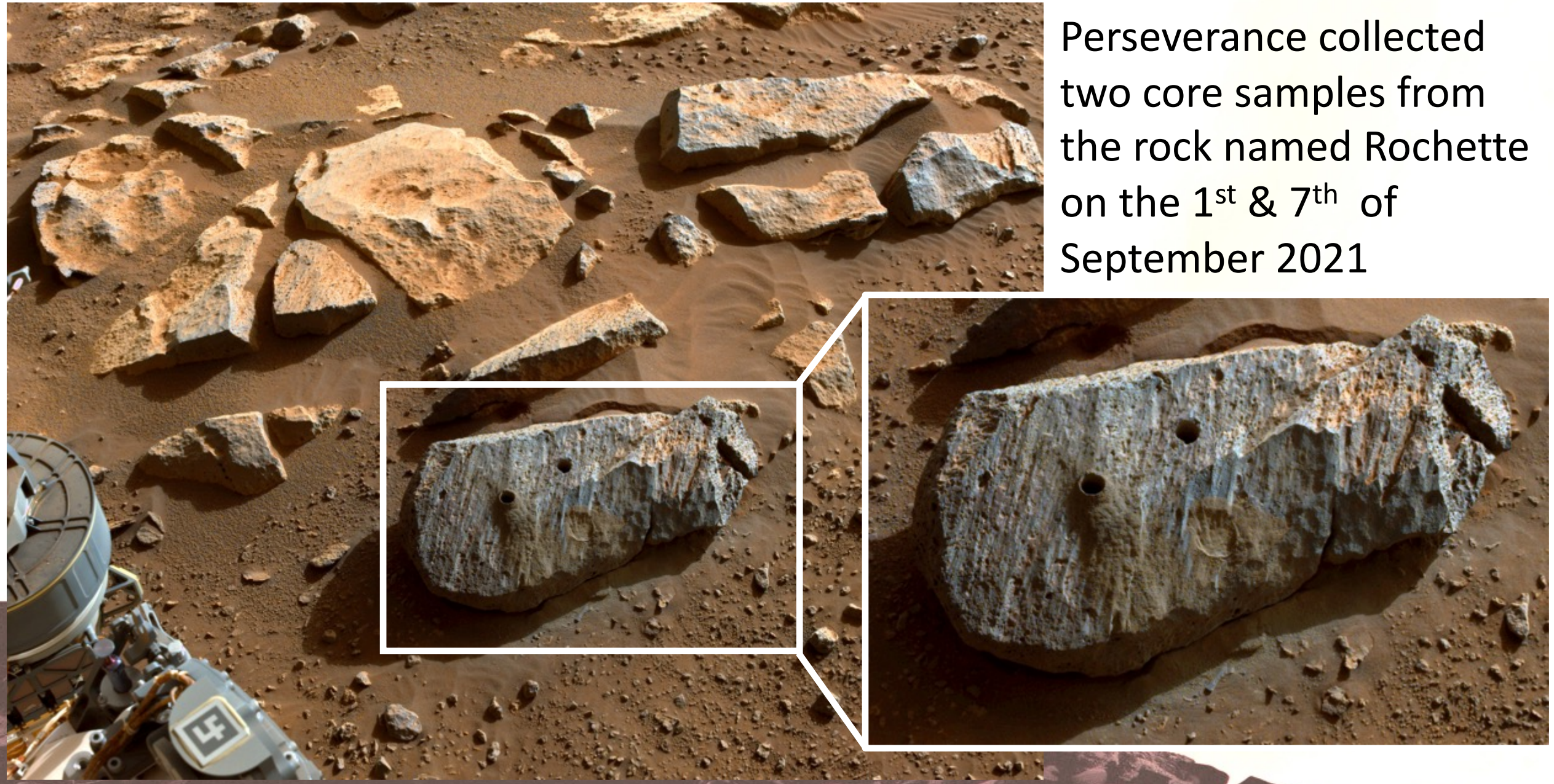
Images and information from https://mars.nasa.gov/mars2020/

Perseverance collected two core samples from the rock named Rochette on the 1st & 7th of September 2021



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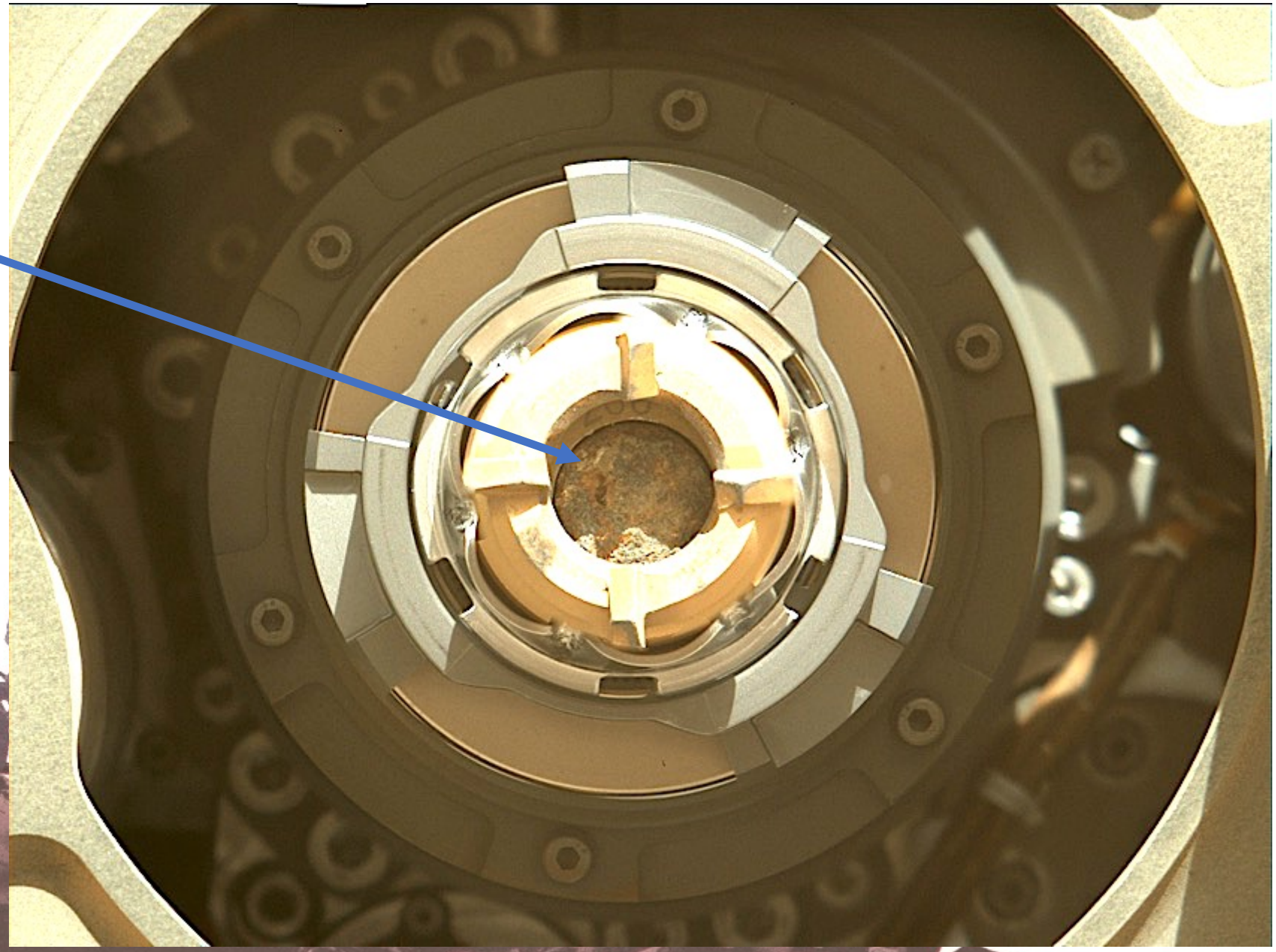
Images and information from https://mars.nasa.gov/mars2020/

The first rock core sample inside the Perseverance sampling drill bit



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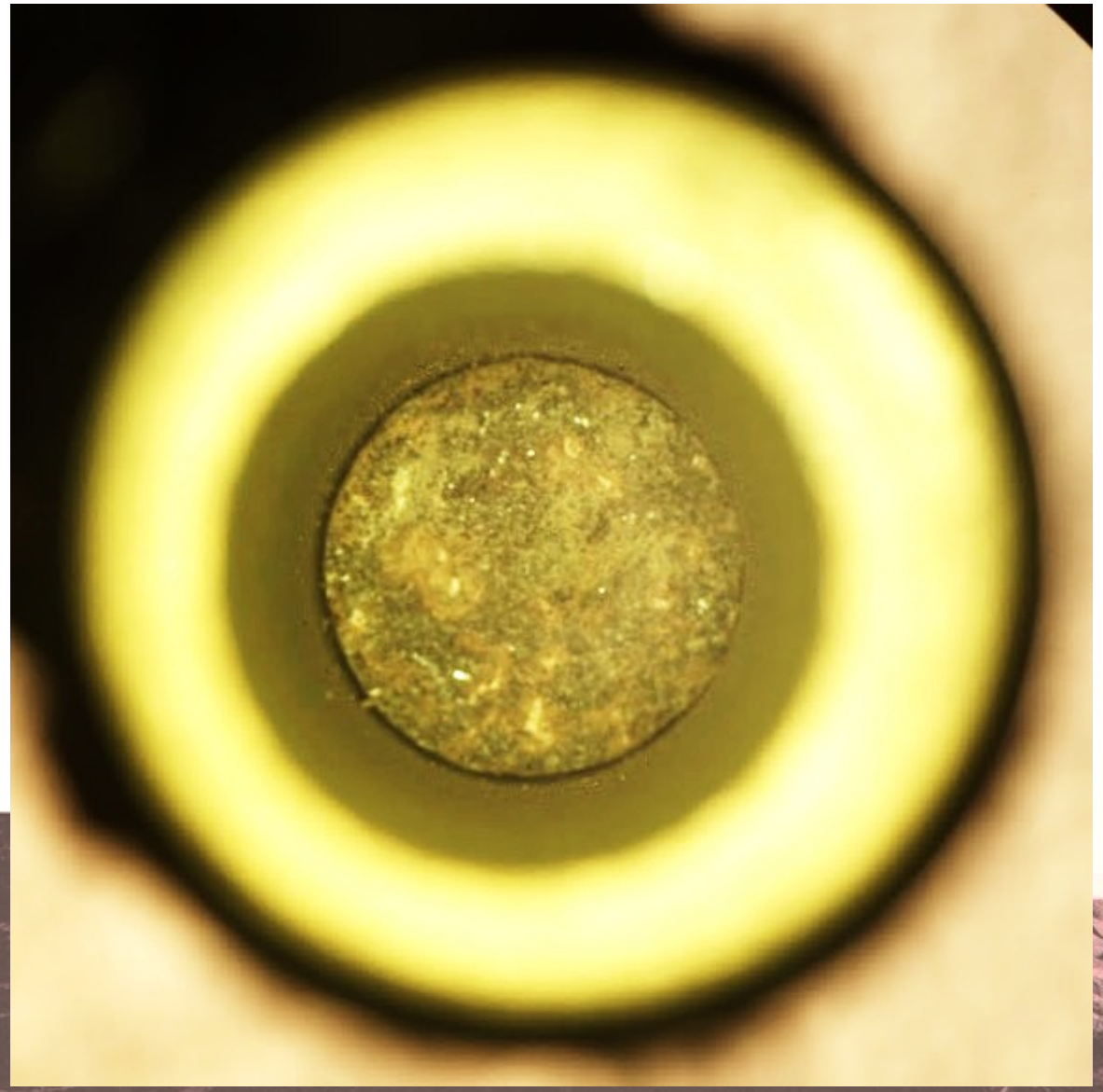
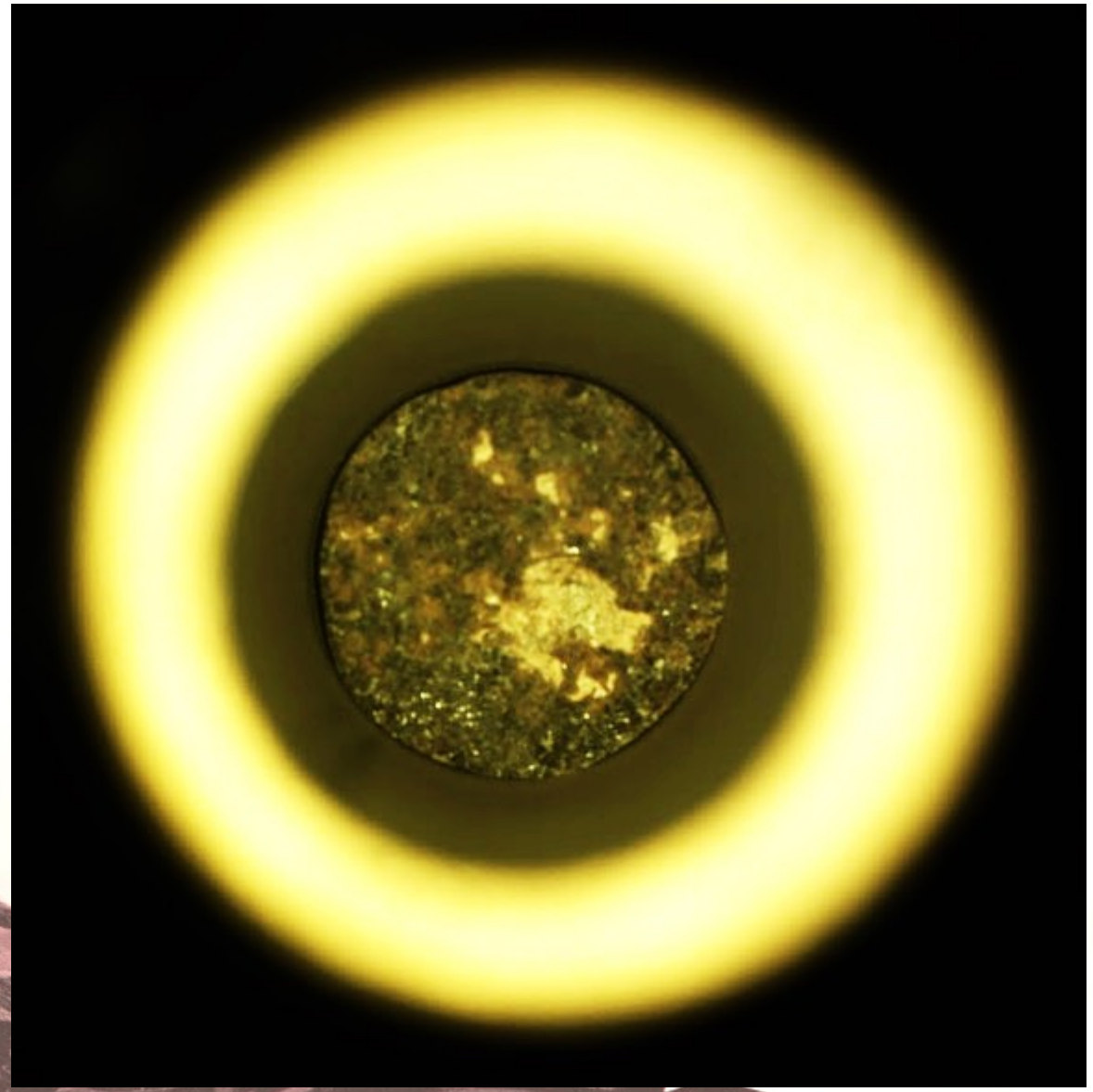
Images and information from https://mars.nasa.gov/mars2020/

First rock sample collected on Sept. 1st



Second rock sample collected on Sept. 7th 2021



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Images and information from https://mars.nasa.gov/mars2020/

Selfie taken by the Perseverance Rover on sol 198 next to the rock where two core samples were collected

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Images and information from https://mars.nasa.gov/mars2020/

An image of the Martian landscape taken by the Perseverance Rover

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Images and information from https://mars.nasa.gov/mars2020/

An image of the Martian landscape taken by the Perseverance Rover showing layering in the rocks

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Images and information from https://mars.nasa.gov/mars2020/

Mastcam-Z image taken on sol 204. The layering in the rocks have the scientists very intrigued.

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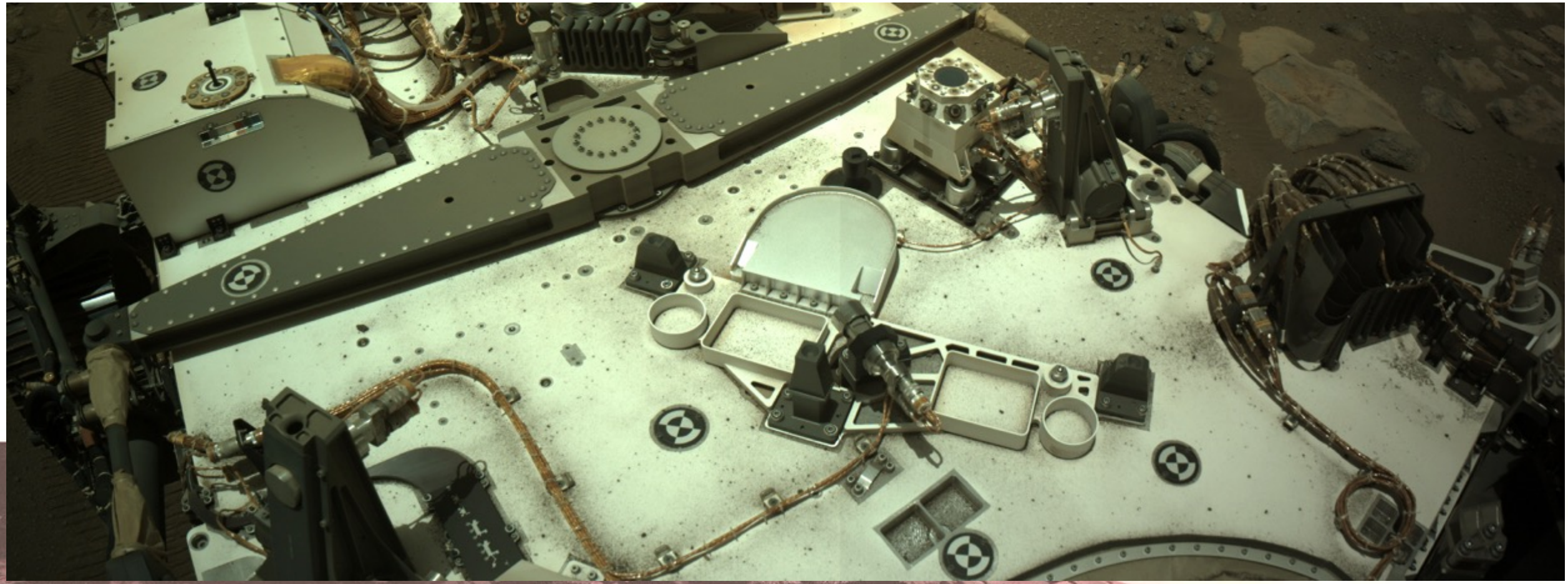
Images and information from https://mars.nasa.gov/mars2020/

Martian dust on the top deck of the Perseverance Rover



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Images and information from https://mars.nasa.gov/mars2020/

More evidence of layering in rocks imaged by the Perseverance Rover

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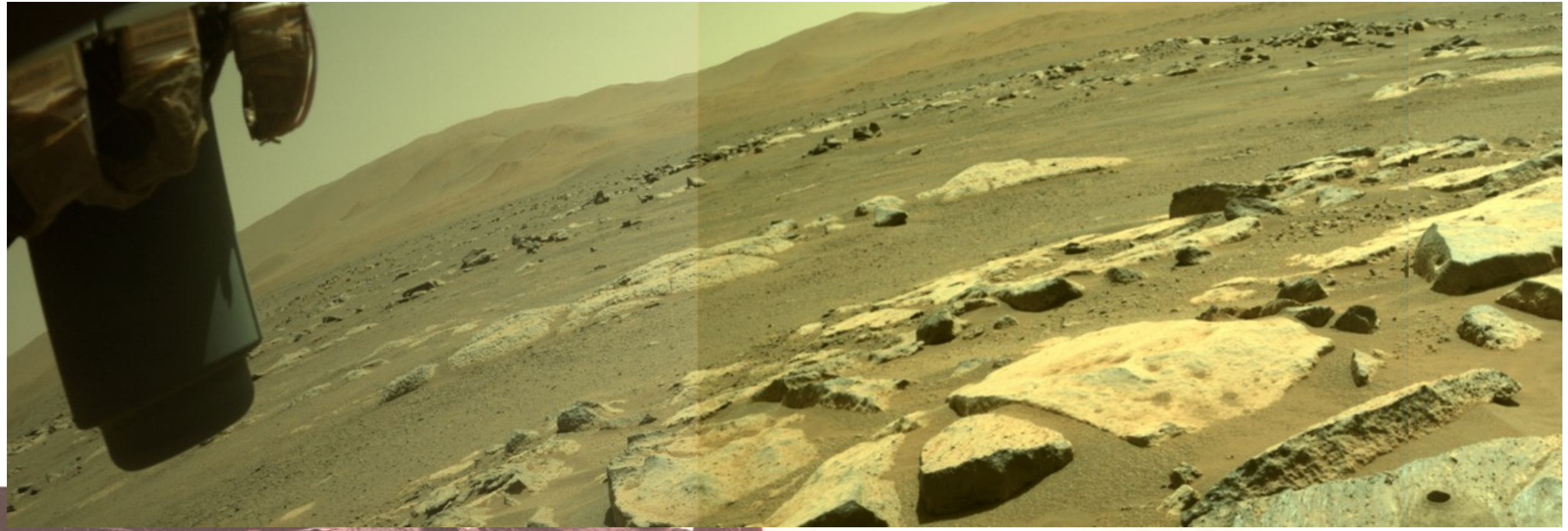
Images and information from https://mars.nasa.gov/mars2020/

Martian landscape mosaic taken by the Perseverance Rover



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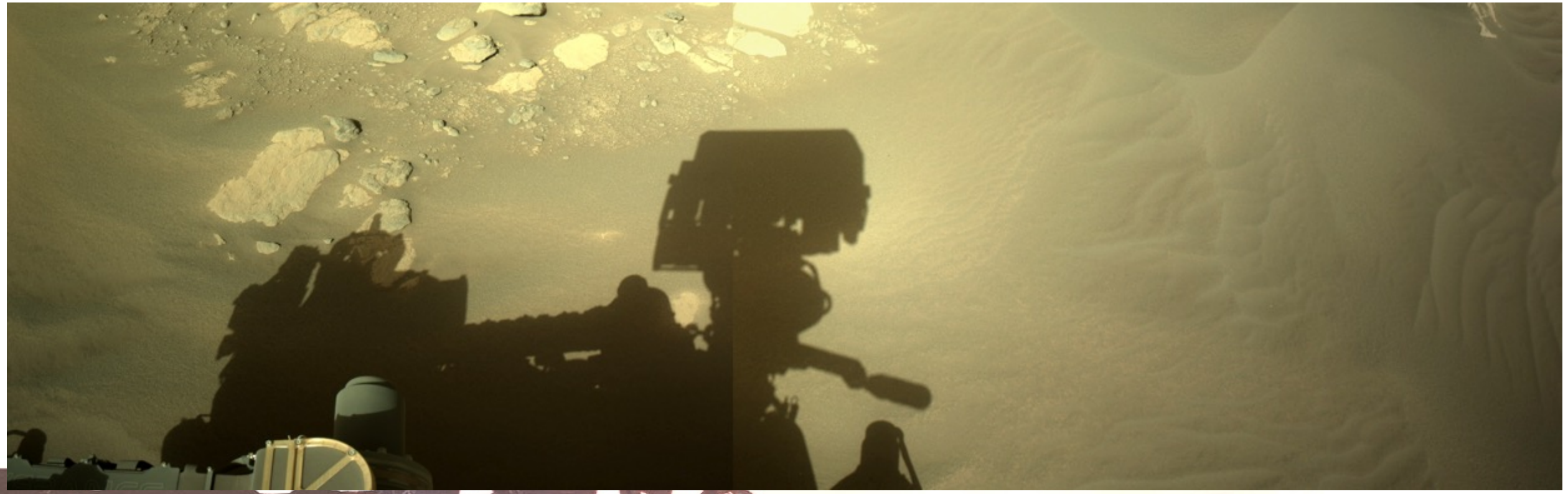
Images and information from https://mars.nasa.gov/mars2020/

Navcam image of the Martian surface and the shadow of the Perseverance Rover



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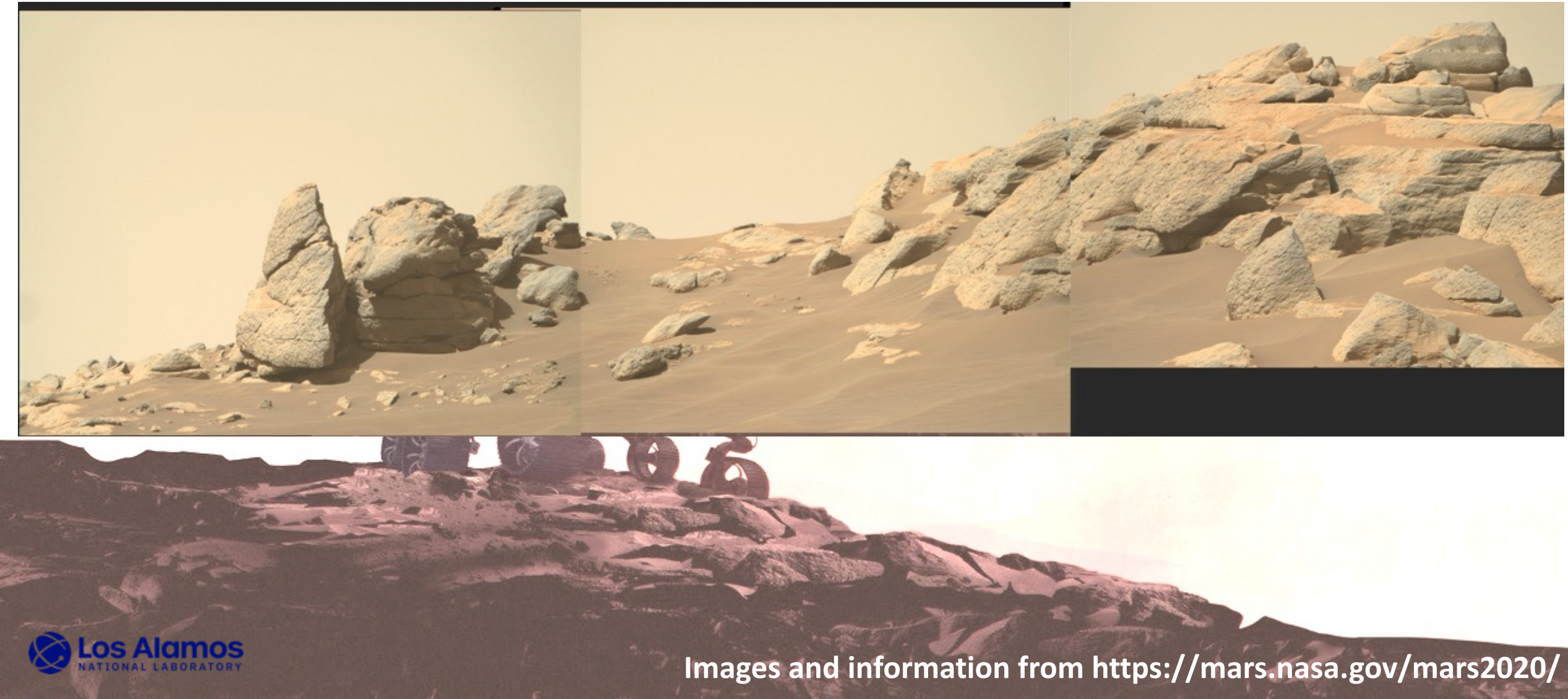
Images and information from https://mars.nasa.gov/mars2020/

Mastcam-Z mosaic of a rocky outcrop collected on sol 209 (21 September 2021)



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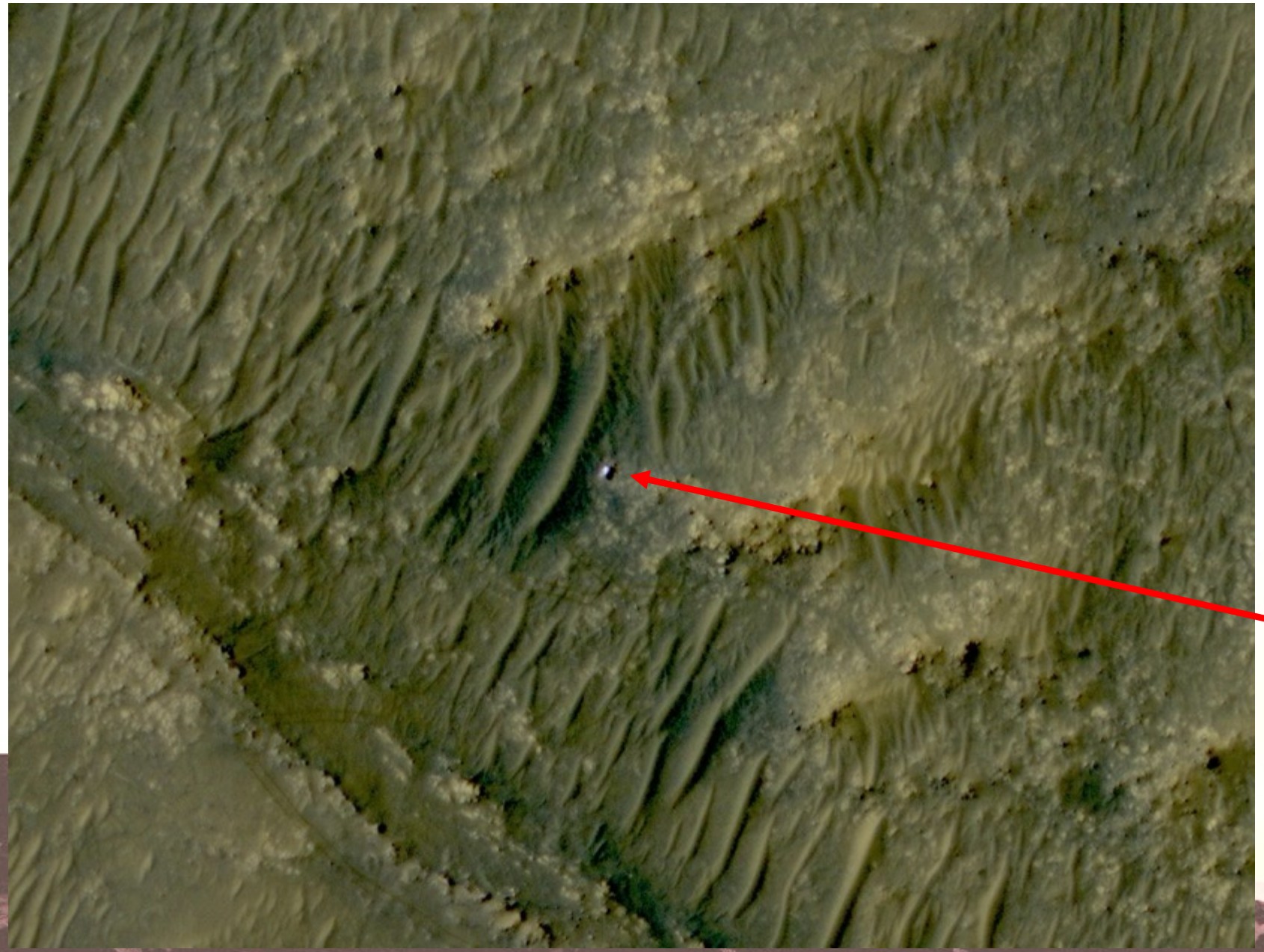
Images and information from https://mars.nasa.gov/mars2020/

Perseverance Rover in the “South Seitah” area of Jezero Crater taken from orbit by the Mars Reconnaissance Orbiter



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Images and information from https://mars.nasa.gov/mars2020/

Mastcam-Z image of the surface around the Perseverance Rover taken on sol 208 (20 September 2021)

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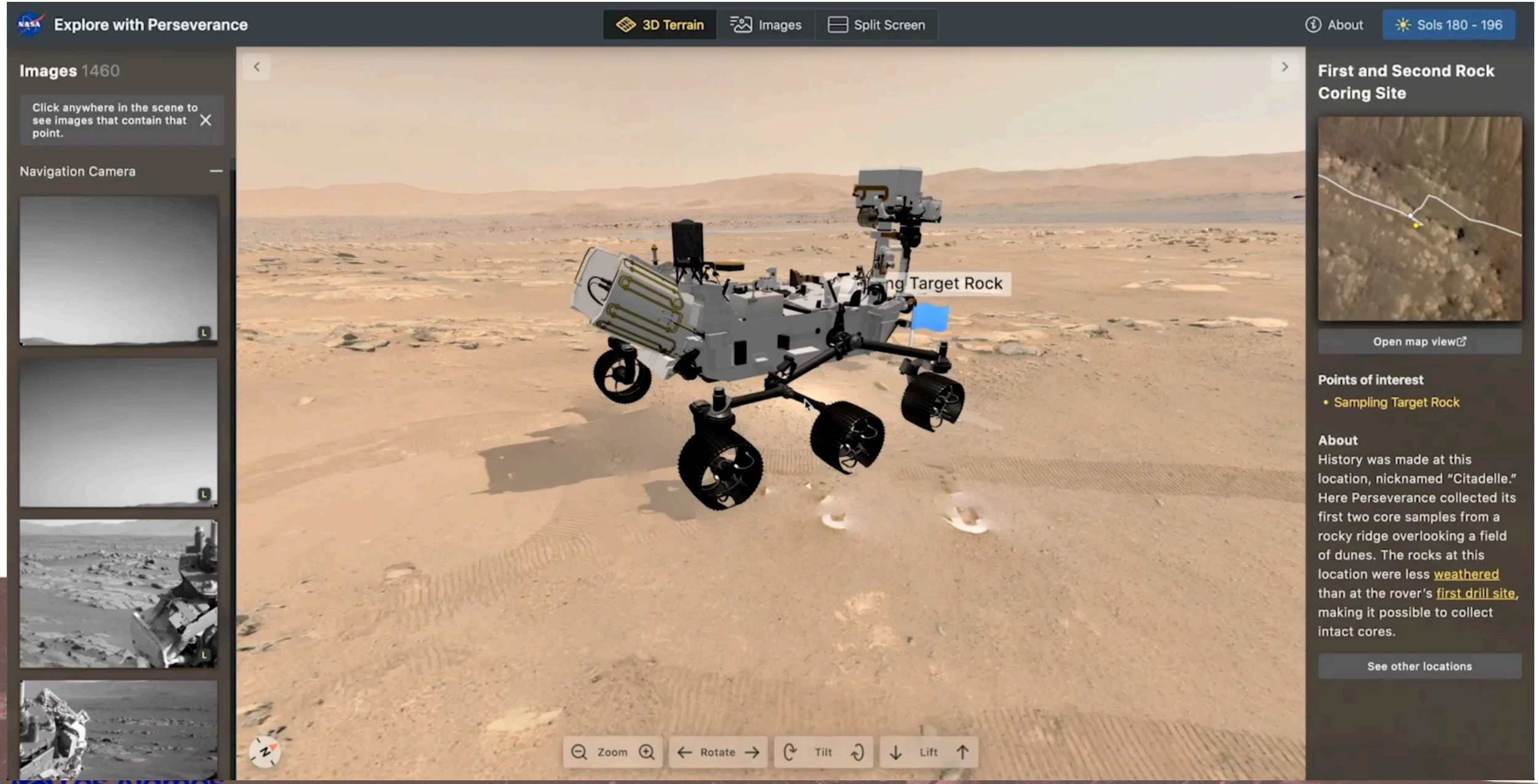
Images and information from https://mars.nasa.gov/mars2020/

Interactive 3D experience “Explore with Perseverance” that allows you to be a Mars explorer



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Images and information from https://mars.nasa.gov/mars2020/

Dunes on Mars consisting of fine-grain soil sculpted by blowing wind. Image taken by the Navcam on sol 213 (25 September 2021).

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Images and information from https://mars.nasa.gov/mars2020/